

**Report**

**Impact Assessment of the AG/NRM  
Strategic Objective of  
USAID/Senegal  
(OLD SO2)**

**Volume 1 of 3**

May 1999

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(OLDSO2)**

**Volume 1 of 3**

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For  
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## **Preface**

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# Acronyms

AG/NR	Agriculture/natural resource
AG/NRM	Agriculture/natural resource management
CBNRM	Community-Based Natural Resource Management Project
CERP	Centre d'Expansion Rural Polyvalent
CONSERE	Conseil Supérieur des Ressources Naturelles et de l'Environnement (Senior Council for Natural Resources and the Environment)
CPSP	Country program strategic plan
CR	Communauté rurale (rural community, the lowest level in the official government structure and similar to a U.S. county )
CR	Conseil rural (rural council, governing body of the communauté rurale, similar to a U.S. county board)
CSE	Centre de Suivi Ecologique (Ecological Monitoring Center)
CTC	Community training center
EROS	Earth Resources Observation Systems (Data Center)
FCFA	Franc de la Communauté Financière Africaine (local currency of the member states of the West African Monetary Union)
FY	Fiscal year
GIE	Groupement d'intérêt économique
GIS	Geographic information system
GOS	Government of Senegal
GRN	Gestion des ressources naturelles
IR	Intermediate result
ISRA	Institut Sénégalais de Recherches Agricoles (Senegalese Agricultural Research Institute)
KAED	Kaolack Agricultural Enterprise Development (Africare)
KAP	Knowledge, attitudes, and practices (survey)
KIR	Key intermediate result
LUMP	Land use management plan
MEPN	Ministère de l'Environnement et de la Protection de la Nature (Ministry of the Environment and Protection of Nature)
NEAP	National environmental action plan
NGO	Nongovernmental organization
NRBAR	Natural resource-based agricultural research
NRM	Natural resource management
NRMC	NRM committee
OFPEP	On-Farm Productivity Enhancement Program (Winrock)
PMU	Project management unit
PRA	Participatory rural appraisal
PVO	Private voluntary organization



R4	Results review and resource request
RRA	Rapid rural appraisal
SAV	Sensibilisation, animation, et vulgarisation (commission)
SECID	Southeastern Consortium for International Development
SO	Strategic objective
SOMIVAC	Société pour la Mise en Valeur Agricole de la Casamance
SRP	Senegal Reforestation Project
SZWM	Southern Zone Water Management
USAID	U.S. Agency for International Development
USGS	U.S. Geological Survey

# Executive Summary

**Scope and Purpose of the SO2 Impact Assessment.** This report presents the results of an assessment of the overall impact of the USAID/Senegal agriculture/natural resource management (AG/NRM) strategic objective (old SO2). The assessment team, mobilized in October 1998, completed its fieldwork in April 1999. The team focused on three principal tasks: (a) describing and assessing the results and impacts of agriculture and natural resource (AG/NR) program investments from 1992 to 1998 in the context of USAID/Senegal's recently completed Country Program Strategic Plan (CPSP), (b) analyzing data sets from the knowledge, attitudes, and practices (KAP) surveys to identify plausible causes, reasons, purposes, and logic for use and nonuse of improved AG/NR practices and technologies in rural districts, villages, and households, and (c) providing technical assistance to USAID/Senegal and the selected local contractor on executing the 1998 KAP household survey.

The team was asked to look at some ten programs funded under SO2 from fiscal 1992 to fiscal 1998. The assessment process placed more attention on the Community-Based Natural Resource Management Project (CBNRM) activity, because it is the only program originally financed under the AG/NR SO2 that is continuing beyond September 1998. The team looked at the contribution of SO2 programs, particularly CBNRM and the Kaolack Agricultural Enterprise Development (KAED), to improved democracy and governance (the new SO2) and to private enterprise development and income generation (the new SO1) as well as synergies between the two.

**Agriculture/Natural Resource Strategic Objective (Old SO2).** The AG/NR strategic objective was intended to increase crop productivity by improving natural resource management (NRM) in zones of reliable rainfall (greater than 400 millimeters). This SO was created by consolidating two prior SOs: (a) increased crop productivity in zones of reliable rainfall and (b) increased value of tree production. The two were fused in part to merge mission objectives in an era of declining resources and in part to parallel the Mission's transition from previous forestry programming (the Senegal Reforestation Project) to the broader concept of NRM (CBNRM).

**Approaches Used in the Assessment Process.** The assessment process integrated a number of different approaches used by the Environmental Policy and Institutional Strengthening Indefinite Quantity Contract (EPIQ) team. In addition to a review of project reports, evaluations, and other secondary sources, the assessment team examined the maps, imagery, and other results of the long-term ecological monitoring activity carried out with the assistance of the U.S. Geological Service/Earth Resources Observation Systems Data Center (USGS/EROS). The team also assisted in completion of a household-level KAP survey of rural producers involved in NRM activities and used rapid rural appraisal/participatory rural appraisal (RRA/PRA) techniques to assess the local impacts of SO2 programs in selected areas directly. The RRA/PRA exercises provided insights into why certain changes have or have not occurred, helped the team assess the perspective of local populations on the practices that had been promoted, and provided additional information that helped in interpreting the results of the KAP surveys.

The team also analyzed the costs and benefits of selected AG/NR practices from the farmers' points of view. This analysis allowed the team to assess which practices are sustainable and replicable on the basis of their financial and economic merits and helped explain farmers' behavior regarding the adoption of practices.

To appreciate the impact of the AG/NR program investments more fully, the team identified major trends related to an analysis of the ecological and historical context of rural development programs in Senegal, giving particular attention to rainfall, population, and the impact of structural adjustment and changes in agricultural policy. The team then summarized the main objectives and outputs of the various AG/NR programs and provided a technical and institutional analysis of the results of the major activities and strategies funded under SO2. From these various analyses, the team identified findings and conclusions on the impact of the AG/NRM strategic objective and provided conclusions and recommendations regarding the linkages between the AG/NRM strategic objective program activities and the new SO1 and SO2. The team also identified lessons learned regarding the different approaches of the old SO2 programs, monitoring techniques and surveys, improving the diffusion of NRM practices and technologies, and enabling conditions that contribute to the successful adoption of NRM practices.

**Ecological and Historical Context.** The agricultural sector, including forestry, livestock, and fisheries, accounts for approximately 20 percent of gross domestic product and for 60 percent of employment. From 1978 to 1996, long-term growth of the agricultural sector averaged 2.0 percent, but agricultural sector production increased in only 7 of the 19 years in question. Crop production recorded even larger swings, primarily as a function of good and bad rainfall years; however, given the population growth rate of 2.7 percent (and even higher in past years), average per capita agricultural production has fallen in the 19-year period. EROS estimates that the area under cultivation has expanded at approximately 1 percent per year. Given a rapid decline in fallow land, the total increase in land cultivated may have approached the 2 percent level, similar to average long-term agricultural growth. Because this is less than the rate of population growth, however, the area cultivated per capita has declined from about 0.5 to about 0.3 hectare.

Other significant trends caused by changes related to structural adjustment have been the decline in the use of chemical fertilizers and the aging of farm equipment. In the absence of soil fertility amendments and measures to control soil erosion, traditional practices tend to exacerbate soil degradation. In addition to soil degradation caused by cultural practices, the expansion of cultivated areas and decline in fallow land have caused rural producers to place increasingly marginal land in production. One would have expected that the reduced use of these various factors of production, combined with significantly lower rainfall would result in appreciably lower agricultural production. By some estimates, the decline in rainfall alone might have been expected to reduce agricultural production in Senegal by 20 to 30 percent since the 1950-60 period. Given the reduced use of these factors of production, the expected decline would have been even larger. Because production has increased slowly at the rate of about 2 percent a year, farmers appear to have had some success in adjusting their production systems to address the effects of lower rainfall and both limited access to improved inputs and limited use of labor. It seems likely that a few key technologies, such as the use of shorter cycle varieties and natural soil fertility enhancements (manure, compost, and *Acacia albida* field trees), have had a positive impact in avoiding the sharp drop in agricultural production one might have predicted.

Structural adjustment has had a mixed impact on rural producers. The 1994 devaluation, which was implemented while prices of many commodities were still controlled by the government, did not produce the doubling in export crop prices implied by the 50 percent devaluation. The combination of devaluation and liberalization of most export crop markets has still not produced the price increases that many observers had hoped would result. Structural adjustment has also led to government disengagement from providing basic rural services. Many parastatals that had previously provided these services (some only marginally functional in practice because of operational losses and debts) were downsized and had their mandates restricted or were dissolved outright. But the commercial private sector found little or no incentive and support to expand to fill this void and has not done so. In many areas of Senegal, basic rural services-the enabling conditions for a productive and profitable rural sector-have been declining at least since the early 1990s.

Until basic agricultural services (e.g., credit, agricultural inputs, marketing, and extension services) are again available to the majority of farmers (male and female) who are targeted by the narrowly focused AG/NRM programs, those farmers and the narrowly focused AG/NRM programs have little chance of increasing agricultural productivity or having a significant impact on rural incomes. One must ask if economic growth can occur in rural Senegal in particular and Senegal in general until basic agricultural services are available to rural producers and the agricultural research and extension system functions in a reasonably adequate manner.

The major findings and lessons that emerged from the analysis of the ecological and historical context include the following:

- Most farmers do not have access to basic agricultural services, such as credit, agricultural inputs (improved seed, fertilizer, and equipment), and extension services
- In the 15 to 20 years since the government began its policy of disengagement, the commercial private sector has not stepped in to fill the void.
- Disbanding parastatal organizations and market monopolies alone is not sufficient to entice the commercial private sector to take up responsibility for providing basic agricultural services (or 15 years is not long enough for that to take place)
- Narrowly defined SO2 programs have had little chance to attain their long-term development objectives of increased agricultural productivity and increased rural income, given that basic agricultural services, which, as noted above, are among the enabling conditions for productive and profitable agriculture, have not existed during the period in which the strategic objective was in effect.
- Narrowly defined programs are not sufficient to increase agricultural production and rural incomes unless those programs work in an environment in which the basic enabling conditions for a productive and profitable agriculture already exist.

**SO2 Background and Overview.** The overall goal to which the strategic objectives of the 1992-97 CPSP were intended to contribute was "increased private income from natural resources." The strategic objectives were intended to contribute to the subgoals of "increased value of marketed output" and "increased value of home consumption," whereas a population strategic objective helped contribute to "increased availability of natural resources per capita." Initially, the 1992-97 CPSP contained three strategic objectives related to agriculture and natural resource management:

- SO2: increased crop productivity in zones of reliable rainfall
- SO3: increased value of tree production
- SO4: increased liberalization of the market

By the time that SO2 was discontinued in 1998, all three of these objectives had been incorporated into a single AG/NR SO.

During 1996 USAID/Senegal spent a substantial amount of time and effort on re-engineering. The goal- and subgoal-level objectives remained essentially the same as originally stated in 1991. In the re-engineering and redesign process, the market liberalization SO- "increased liberalization of the market for agricultural and NRM-based products"-was "graduated." It had successfully achieved its operational policy reform objectives regarding the liberalization of marketing and pricing in the rice sector, and USAID/Senegal needed to rationalize staff in the face of staff reductions. The few remaining elements of the market liberalization strategic objective were folded into the AG/NRM SO, resulting in the addition of key intermediate result C below. What had previously been called "targets" or "program outcomes" in previous objective tree systems were now labeled "key intermediate results" (KIR), which in turn were supported by "intermediate results" (IR).

It is unclear to what degree the changes in program objectives, targets, and indicators actually affected the overall achievement of field-level results from SO2 program investments; however, from the standpoint of many USAID partners and implementing agencies, it is likely that the program impacts have been reduced as a consequence of the time and effort shifted from program implementation to re-engineering, redesign, and adjustments in program targets and performance-monitoring indicators.

The revised results framework for the AG/NRM strategic objective consisted of the following KIRs and IRs:

**SO2: Increased crop productivity through improved NRM in zones of reliable rainfall**

- KIR A: Increased land investment
  - IR A1.1: Land tenure at the rural level secured
  - IR A1.2: Land investments secured
- KIR B: Improved NRM practices mastered and used by farmers
  - IR B1.1: Farmer exposure to improved NRM technologies increased
- KIR C: Increased access to commodity and input markets increased

- IR C1.1: Transportation infrastructures improved
- IR C1.2: Number of markets increased
- IR C1.3: Market liberalization increased
- IR C1.4: Processing and conservation structures developed
- KIR D: Increased access to capital increased
- IR D1.1: Transportation infrastructure improved
- IR D1.2: Credit and savings institutions improved

SO2 included interventions focused on policy change, decentralization of NRM decision-making, implementation of targeted NRM activities and the diffusion of NRM practices. The 1997 results review and resource request (R4) indicates, however, that the bulk of the SO2 resources and activities have been concentrated on KIR B, with few resources available for KIR A, C, and D.

As discussed between USAID/Senegal and USAID/Washington, the primary purpose of SO2 was to identify and establish an enabling environment for improved NRM in Senegal. In the final analysis, the critical outcome from SO2 is its contribution to the enabling conditions for AG/NRM technology use, improved planning and decision-making concerning land use and natural resource management, and increased economic choices. All of these do directly or will in time contribute to increased crop productivity, improved rural incomes, and a stronger civil society.

**SO2 Performance Monitoring.** Despite considerable efforts to design and implement surveys, monitor changes in ecological conditions, and track program results, the assessment of SO2 performance and impact had been problematic and not very effective up until 1998. With the exception of CBNRM, SO2 programs did not do baseline studies at the beginning of their interventions. At the time of the impact assessment, CBNRM field activities had not been under way long enough to warrant a follow-up study to compare with the baseline. So, at the time of the EPIQ impact assessment, no SO2-funded program had done a normal comparison of the status of the program area with and without (before and after) the program. Most of the programs had done a single KAP-type survey at some time during the course of the programs. This allowed some characterization of the programs' target areas, but did not provide the means to assess the impact of the programs over time.

USAID/Senegal has performed a KAP survey covering the entire zone of reliable rainfall biannually from 1992 through 1998. The "national" KAPs focus on results at the level of the Senegalese administrative units, referred to as regions or departments. Most SO2 programs, however, had only a smattering of target villages in any one department, with the exception of CBNRM, which had only been implementing field-level activities for 2 years. The "national" KAPs were structured as random samples and did not stratify the samples to target participants in SO2 programs specifically to compare them with nonparticipants.

Owing to staffing and other problems outlined in the 1998 "Limited Scope" SO2 Impact Assessment report, the SO2 program-monitoring information system had difficulty storing, retrieving, analyzing, and reporting the results of the KAP surveys. Limitations in data analysis and diffusion of NRM program monitoring information impeded the flow of this information among SO2 partners and restricted the extent

to which the Mission was able to make effective use of the KAP survey data. This analysis of the KAP data and assessment of the strengths and weaknesses of the KAP as a monitoring tool, however, provides a number of lessons learned that can be applied by the Mission to improve program monitoring and performance.

**Analysis of the KAP Household Surveys.** The KAP surveys were designed to track the adoption of selected NRM practices by rural producers, as well as changes in the conditions affecting the adoption of these practices, such as trends in availability of labor, financing, and changing perceptions of constraints to the adoption of practices. Special attention was given to collecting data designed to characterize and distinguish between adopters and nonadopters of NRM practices, such as land ownership, knowledge of the Forest Code, extension visits, and other factors.

The KAP collected gender-disaggregated data on the percentage of households that knew about or used a range of NRM practices, including live fences, field trees, windbreaks, compost, manure, fallow, and improved seeds. Despite labor shortages and low or declining incomes, analysis of KAP data from 1992 to 1998 revealed a significant increase in adoption of many NRM practices, including tree planting associated with live fencing as well as windbreaks, woodstoves, and field practices related to water management. The most consistent increases were observed in the Kaolack and Fatick areas. The largest increases were in the Kolda region. The adoption of NRM practices was strongly affected not only by the ecoregional endowment but also by the number of extension visits and access of households to labor and capital.

**Assessment of the Impact of SO2 Programs.** In terms of SO2 program contributions to KIRs, the assessment team noted that SO2 activities contributed to increasing land investments, particularly by women, as well as increased access to capital through commercial credit and shared income from group enterprises. Logically, if SO2 was intended to achieve impact primarily by diffusing NRM practices to rural producers, it needed to include or have the support of some broadly based diffusion programs as well as extend some adapted and proven technologies. SO2 has neither included nor had the support of such broadly based diffusion programs. Most of the SO2-funded programs focused on village-level activities, dealing with anywhere between a handful and several hundred villages. Some of these programs may have had a major impact on the target villages, but limited impact at a higher level of aggregation such as the regional or national level.

Two individual programs and a complex set of interrelated programs stand out among the eleven programs financed under the AG/NRM strategic objective (old SO2). These programs stand out for what they have accomplished, the importance of the concepts that they have or are trying to prove, and their potential to inform future USAID/Senegal programming, particularly the new SO1 and SO2. This does not imply that the programs should be replicated blindly, but rather that much can be learned from what they have been able to achieve and from those aspects that accomplished less or were more costly than they could have been. The individual programs are KAED and Winrock, and the complex set of programs is the continuum from SRP to CBNRM (discussed below), along with the other programs funded in the broader context of SRP and CBNRM.

**Kaolack Agricultural Enterprise Development Program.** KAED worked with communal groupements d'intérêt économique (GIEs) to develop small-scale enterprises at the village-level. It trained GIE members in functional literacy and financial management and provided access to credit through financial institutions. A number of the GIEs have successfully reimbursed two, three, and four loans since 1995 and have established a relationship of trust with the financial institution so that it no longer requires a guarantee after the third loan to any individual KAED-sponsored GIE. KAED incorporated villagers in identifying problems and potential solutions through the use of a PRA and particularly in the choice of a primary enterprise within the narrow range of predetermined activities that Africare/KAED proposed to finance.

The program established demonstration fields to demonstrate NRM and improved agricultural practices. It is not yet evident that the demonstration fields have had a major impact on NRM and agricultural practices, but it did serve two important purposes, perhaps both unplanned. It served to demonstrate that women could gain access to land through group activities and obtain a formal certificate of their use rights from the rural council. It also served as a means for the GIE to accumulate capital. This capital was most often used to establish a revolving fund from which members could receive a loan to fund small-scale trading activities and thereby improve personal income. The combination of training, demonstration field work, work to establish a primary enterprise, and revolving credit in many of the fifty-six cases resulted in a cohesive and functional GIE, in addition to establishing an enterprise.

It is important to distinguish between the GIE and enterprise, because (a) many GIEs have multiple enterprises and activities and (b) several GIEs have reoriented when a primary enterprise proved unsuccessful, begun a new primary enterprise, and have still managed to reimburse their loan. GIEs are also beginning to expand their roles in the community by using a portion of the loans they receive to expand a revolving fund for small-scale trading, purchasing agricultural inputs such as seed and fertilizer and so on.

NRM results included the following: (a) KAED established more than 1,000 improved stoves as well as trained village women on how to repair or replace these stoves, (b) KAED was more successful than most programs in introducing composting, probably because it did not insist that composting should be done in cemented pits, and (c) KAED stimulated the demarcation of field boundaries with trees, apparently done primarily for reasons of land tenure security than as windbreaks or live fences.

KAED demonstrates four important attributes that are important to future USAID/Senegal programming:

- It demonstrated the capacity to establish rural enterprises that are well managed and operate profitably.
- It demonstrated the capacity to help identify which types of enterprise activities have a good chance of being remunerative or the conditions necessary to allow them to operate profitably.
- The experience demonstrated that GIEs, local groups, and coops can set up and manage local enterprises that profitably provide basic rural services if they have access to capital and training in functional literacy and financial management. Promoting the provision of basic rural services through these local GIEs provides USAID programming with a means



of helping establish the enabling conditions necessary for productive and profitable agricultural programs within the framework of a liberalized economy and private sector orientation.

- These communal GIEs are an exercise in group and enterprise governance. The training and the process of establishing the GIEs and their enterprises develop many of the skills necessary for improving good governance at the grassroots level. Many, if not most, of the GIEs operate in a manner that demonstrates accountability, transparency, and democratic procedures. This provides an opportunity for significant synergy between SO1 and SO2. A KAED-like SO1 orientation can help provide people-level impact, as well as help bring better governance to the grassroots level.

**Senegal Reforestation Project: A Continuum from SRP to CBNRM.** This set of programs is best viewed as a continuum. Both programs have been based on innovative concepts that had not previously been tested on any significant scale. The two programs have shared an institutional location (under the tutelage of the Forest Service), organized with nearly the same set of administrative components, and a not insignificant portion of the staff have served in both programs in some capacity. SRP was extended for two years specifically to serve as a bridge to the CBNRM program and to establish a test program that would check the feasibility of some key aspects of the CBNRM concept. Both programs share the use of "matching grants," which under SRP made substantial cash payments to reimburse participants for a portion of the cost of planting trees.

This continuum has been positive to the extent that the test program informed and improved the design of the CBNRM program, in addition to extending the policy activities begun under SRP. The continuum has had negative consequences related to the (a) continued fascination with the "matching grant approach" and (b) adoption of SRP's highly centralized structure and institutional location associated with the Forest Service. CBNRM was revised to focus as much or more on promoting decentralization as on promoting NRM, but no change was made in the highly centralized structure and institutional association.

CBNRM is testing strategies to render the government's decentralization policy operational. This testing began during the final test program phase of SRP, which resulted in the introduction of NRM committees (NRMCS) to represent the different groups in civil society at the rural council level, the use of "animators" to ensure the timely completion of administrative and financial reports, and an extensive training program for the centres d'expansion rural polyvalent (CERPs), NRMCS members, and animators. SRP also initiated funding for several policy activities, which were continued under CBNRM, including the establishment of Conseil Supérieur des Ressources Naturelles et de l'Environnement (CONSERE) and the effort to prepare the National Environmental Action Plan (NEAP) and activities related to the preparation of a new Forest Code and several updates. The environmental monitoring program of EROS/Centre de Suivi Ecologique (CSE) funded under CBNRM helps provide the information necessary to inform decision-making and policy formulation.

SRP did not monitor global tree survival rates, but achieved the 45 percent survival rate necessary to receive the minimum cash payment on 55 percent of the area and linear distance planted. The "matching grant" cash payments often reimbursed individuals or groups for most of the real cost of planting trees,

because the process was usually subsidized by a regional forestry project as well. These cash payments were not sufficient to get trees planted without other public sector interventions, nor were they sufficient to result in high survival rates. The system of cash subsidies was biased against low-cost activities such as natural regeneration because these had few costs to subsidize. The same system of matching grant payments was retained during the early microréalisation phase of CBNRM, but was not successful without the support of other programs' fieldwork activities. CBNRM then turned to a group orientation in developing the subproject approach and establishing federations of local GIEs and associations to implement the subprojects.

CBNRM is attempting to do several things and test several innovations that will have important long-term impacts. It is attempting to (a) target interventions at the rural council level instead of the traditional village level in an attempt to increase the pace at which development programs impact rural Senegal, (b) operationalize the decentralization of and local participation in decisions related to land use and NRM, (c) toward this end, design and implement a participatory process of regional planning with a strong environmental component, (d) introduce some promising democracy and governance interventions in an attempt to influence institutions and decisionmaking at the rural council level, (e) develop a system of representative participation that allows it to use a participatory approach while working at a level several steps removed from the population, (f) implement some NRM interventions, (g) integrate NRM and income-generating activities in the subproject approach, and (h) produce people-level impacts that will result in increased incomes. Given the innovation and importance of what it is attempting, CBNRM will be a landmark program, whatever the outcome may be.

It is difficult to say anything about (a) and (b) above, because that will depend on the long-term results of the program.

- 1) CBNRM has implemented land use management plans (LUMPs) that provide major elements of regional planning at the rural council level and include a strong NRM and environmental component.
- 2) The NRMCM seems to be characterized by accountability, transparency, and democratic procedures and is beginning to influence what is considered acceptable practice and procedure among local institutions, particularly the rural councils.
- 3) CBNRM is attempting to establish a representative structure so that it can more easily work in a participatory manner at the rural council level, which is several steps away from the village and the population. In later generations, CBNRM started the process at the zone level, creating several subcommittees to help solidify linkages with the grassroots level. The program initially had these representatives design the subprojects in the place of federations and promoters who will implement them, raising questions on how dedicated those implementing organizations are to the design.
- 4)-6) In many respects, this is where CBNRM faces its greatest challenge. Rural populations are impatient to see the program implement activities that will have a positive impact on their day-to-day lives. But even the potential for people-level impacts is limited using the subproject approach in a situation in which stakeholders do not have access to credit to expand participation beyond what CBNRM can finance. In particular, few individuals will see any significant increase

in personal income from the limited number and scope of income-generating activities planned under the subprojects. Unless the population sees some concrete benefits deriving from the program, they are unlikely to develop any dedication and commitment to either the NRM activities and objectives or the democracy and governance innovations. Without people-level benefits, those aspects of the program may not last long enough to ever achieve their potential impacts.

CBNRM needs to find some ways to attain some "quick victories" in terms of people-level benefits. Programs such as training women to construct improved cookstoves, the Jig Jam protection scheme, and the "seeds for trees" program of Peace Corps and Winrock provide some examples of the types of activities that might provide these "quick victories."

**Winrock: On-Farm Productivity Enhancement Program.** The Winrock On-Farm Productivity Enhancement Program (OFPEP) has developed a farmer-to-farmer seed multiplication and distribution system through which participants multiply the improved seed and pass on seed to additional participants at low cost. It is one of the few programs observed that has many of the characteristics necessary to be self-perpetuating. Other unique features of Winrock's mode of operation include (a) working in association with other organizations that do community development work while Winrock focuses on agriculture and livestock production, (b) training and use of voluntary local facilitators who remain in the area once a program activity ends, and (c) a "seeds for trees" program with Peace Corps that provides improved seeds in exchange for farmers protecting natural regeneration, particularly *Acacia albida*, on the same field.

**Lessons Learned.** The following are some specific lessons learned in the course of this impact assessment:

- The results of narrowly focused programs tend to be necessary but not sufficient to increase agricultural production and rural incomes in the absence of basic rural services (input supply, marketing, transportation, credit, and extension), which, as noted before, are among the enabling conditions for a productive and profitable agricultural sector.
- The adoption of NRM practices and investment in maintaining the natural resource base will primarily be accepted by rural populations when they are linked to helping sustain an income stream (rationale) and can be at least partially supported by that income stream (means). NRM practices should be introduced in the context of income-generating activities through which the NRM practices will contribute to sustaining and improving the income generated (KAED, CBNRM, SZWM, Winrock, and Rodale Institute).
- Unless democracy and governance activities are focused on improving some concrete aspect in the life of local populations, they run the risk of not attracting the dedication and commitment of stakeholders, without which the governance innovations may not survive the end of the program.
- NRM programs in general and CBNRM in particular need to develop a system that prioritizes interventions in a manner that obtains some "quick victories," which then become part of the implementation plan.
- Rural groups, GIEs, and coops in Senegal are reliable and viable business partners that do not consider a loan a gift and work hard to maintain their creditworthiness (KAED).

- Training members to understand principles of accounting and financial management goes a long way toward helping insure accountability and transparency.
- Local groups and coops can establish enterprises that profitably provide basic rural services among other profit-oriented activities, provided that they have access to capital and training in functional literacy and financial management (KAED and other nongovernmental organizations [NGOs]).
- Women's groups have demonstrated the capacity to manage small enterprises and both bank credit and internal revolving credit funds. Individual women have demonstrated competency as representatives of civil society and as officers of businesses.
- This demonstrated economic clout and personal capacity is beginning to change perceptions and attitudes about women at the local level.
- NRM activities, particularly those related to tree planting, have resulted in women gaining access to land both as common (group) and individual fields and receiving certificates of use rights from the rural council.
- Access to land has helped women generate income and capital to finance other activities, particularly revolving credit.

**Considerations for SO1 and SO2 Programming.** The impact assessment team sees potential for significant synergy among activities in the new SO1 (private sector) and SO2 (democracy and governance). This belief is based particularly on the analysis of the KAED and CBNRM programs and the potential interaction of programs adopting the better aspects of these two programs.

Achieving both improved management of the physical territory, which makes up a subzone, and economic growth within that subzone is likely going to require a more intensive interaction and investment than is foreseen in the CBNRM subprojects. The subproject plans outline the need for some fairly ambitious investments in protecting the natural physical environment including erosion control, development and conservation of small valleys, development and conservation of ponds, pasture improvement, improved livestock production, and improved soil fertility. These activities are mapped and planned at the subzone level, but, to the extent possible, will be executed by individuals, using Federations, GIEs and village associations to serve as promoters and organize the individuals. It will be interesting to see if CBNRM succeeds in establishing a system that plans globally but acts individually and whether the aggregation of group and individual activities achieves the subzone-wide plan.

The economic growth activities are thinly spread. For example, in a subzone that contains eleven villages and a few hundred families, these plans only call for a single 1-hectare garden, ten head of cattle for fattening, one input supply store, and a small nursery. Although some or even all of these might be group activities so that entire associations benefit from an increased source of income, typically more associations exist than income-generating activities planned for the subzone. Furthermore, little investment and support will exist for the associations themselves. To date, rural councils rarely have more than one functional literacy program per zone, so many subzones will not even have a local functional literacy program that associations and village groups can access. Some management training will be provided to the federations and promoters beginning in 1999, but this probably will not impact more than one member per GIE or local association. Although this is a beginning, it seems unlikely that it is sufficient to turn these GIEs or local

associations into viable business entities that can successfully undertake income-generating activities on their own. It also is not evident that CBNRM can or will invest in association-specific activities or help arrange access to credit so they can finance their own activities. In addition, a plan does not appear to exist on how different associations can undertake different activities so the subzone ends up with a range of services and income-generating opportunities, each with a clientele sufficiently large to allow the activity to become profitable. An opportunity exists to add this type of economic development planning to the LUMPs, which now focus predominantly on the physical environment and land use, so that they result in a more complete regional plan.

But CBNRM (or a CBNRM-oriented SO2 program) has neither the personnel nor the funding necessary to provide training and mentoring at the level of local GIEs and associations nor a program to provide those groups with access to credit. This is where it would be useful to have the support of an SO1-type program that was oriented toward working directly with these groups, providing training in functional literacy and numeracy and financial management, facilitating access to credit, and providing access to additional resources to implement the program. Given that a number of the GIEs and associations in a small cluster of villages are likely to be overlapping, some economies of scale should be achieved by doing some joint training for groups in close geographical proximity. It should also be useful for several groups in close proximity to target their primary enterprises so they provide a range of services for the combined population of members. With limited resources and where villages and hamlets are in close proximity, providing access to a grain mill, an input supply store, and a grain and peanut marketing enterprise would be more beneficial to the communities than three grain mills. An SO1-type program may be the best placed to support and mentor the development of such enterprises. PRA work and interaction with the types of representative structures developed by a CBNRM/SO2-type program, however, would be helpful in planning these enterprises and organizing them in local clusters. Many opportunities would exist for the two types of programs to interact and help serve the needs of the other, providing synergy.

A CBNRM/SO2-type activity might initiate discussion of separate enterprises serving a small cluster of villages and identify some potential targets of opportunity during a PRA-type activity. Entered in the modified LUMPs/regional plans, this would provide an element addressing economic development and some broad guidelines to help orient an SO1-type activity. If well planned, KAED experience demonstrates that village and professional associations can provide the basis for functional and dynamic GIEs and local coops that operate profitable enterprises. In addition, the successful KAED GIEs have used the capital generated in part to provide revolving credit funds that members can access. These small individual loans, like those to the GIEs, have high repayment rates and demonstrate direct benefits to significant numbers of families and individuals. This is a route to people-level benefits that a SO2 program focusing on management of natural resources at the communal and rural council level has difficulty accessing.

SO1-type activities would provide a base of trained people and better performing GIEs and local associations to contribute to the representative structure developed by an SO2-type activity. As GIEs and local associations develop transparency and accountability and use democratic procedures, they will contribute directly to several SO2 objectives: a change in the norms by which local institutions operate and improved governance at the local level. As in KAED, an SO1 program would likely facilitate access to credit through use of a credit guarantee fund as well as by providing support to financial institutions for

preparing and processing the applications, which would in turn result in support to help GIEs prepare credit applications. By supporting a number of geographical clusters and/or GIEs and local associations within a subzone, the SO1 program would build a program that impacts a critical mass of rural producers and residents in each subzone in which it operates.

**Opportunities for NRM programming in Senegal.** A number of areas exist in which NRM programming in Senegal could be improved to address the degradation of the natural resource base. Rainfall has continued to decline for several decades and not much can be done about it. Many other areas of activity must be undertaken in a manner that takes this declining rainfall into account.

As stated in the lessons learned, many aspects of NRM are most likely to be successful if they are undertaken hand-in-hand with activities oriented toward economic growth. Some of the basic needs for improved NRM are the same as those needed for a dynamic and productive agricultural sector and economic growth in the sector. Among those needs are the availability of basic rural services such as input supply, credit, marketing, transport, and access to information about improved technologies. Experience in other countries indicates that access to adequate agricultural research and extension are prerequisites to increasing agricultural development. Adoption of new technologies, agricultural development, and increased rural incomes are not likely to be part of the future, unless a relatively adequate level of such services is available to rural producers from some source. If macroeconomic conditions do not favor providing such services by the commercial private sector, perhaps programming needs to explore the possibility of providing such services at the local level through GIEs, independent local coops, and so on. Unless the conditions for economic growth and particularly rural development are established, it seems that it will be difficult to facilitate widespread adoption of important NRM practices. NRM activities are a necessary complement to the basics of agricultural development, they are not necessarily a substitute for those basics. In the past, however, the basics often did not include much concern for long-term sustainability nor for insuring that proposed activities were technically, economically, and socially acceptable to rural producers and residents. The NRM activities need to be integrated with economic growth activities to help ensure that the economic growth activities are implemented in a manner that is sustainable in the long run and responds to the needs, desires, and resource constraints of the rural population.

One of those basics is a reasonably functional and adequate agricultural research and extension system. Both agricultural research and agricultural extension do not seem to be very functional in Senegal. With these basic services lacking or in disarray, it is difficult to imagine Senegal making rapid progress toward increased agricultural production, productivity, and increased rural incomes or progress on the NRM activities that would help support them. This lack of dynamic agricultural research and extension programs has direct consequences for NRM activities, which is evident in the cases of technologies such as the use of *Acacia albida* and composting. The benefits of *Acacia albida* are well established, but no broad extension program exists to promote its adoption and use on a large scale. Institut Sénégalais de Recherches Agricoles (ISRA) has not completed the adaptive research cycle regarding composting, and, despite its promise, no composting technology that has proved technically, economically, and socially acceptable to farmers is available for extension to rural producers.

Senegal badly needs to intensify agricultural production in those areas in which conditions are naturally or can be made conducive for intensive agriculture. EROS/CSE projections indicate that, if present trends continue, every scrap of tillable soil in Senegal will be cultivated by the year 2050, including all the land set aside in protected areas. No easy solution to intensification, however, exists, particularly in the absence of adequate rainfall. Where farmers are uncertain that their crops will survive long enough to attain maturity, it is nearly impossible to persuade them to invest in productivity-enhancing technologies. If one could break the cycle of frequent crop failures in those areas with somewhat reliable rainfall with drought-resistant varieties and/or soil moisture-enhancing techniques, perhaps progress could be made. Those farmers who do have the requisite rainfall need access to a series of technologies, each of which increases productivity and profitability as it is added to the system. But such breakthroughs and adapted techniques are unlikely in the absence of an effective agricultural research and extension program.

A number of programming improvements could be made in the forestry and agroforestry area. One of the most obvious, already referred to above, would be a much greater emphasis on natural regeneration in agroforestry activities, where feasible, rather than planting trees. The Jim Jam program costs less to encourage natural regeneration across an entire rural council consisting of thirty-one village territories than it costs to produce a single hectare of tree plantation. And, based on SRP experience, the planted trees often have rather mediocre survival rates, in addition to substantial costs. Where regeneration occurs naturally, the primary cost of increasing tree populations is the time necessary to mark trees for preservation and their potential competition with cultivated crops. Few species are as cooperative as the *Acacia albida*, which loses its leaves during the rainy season in addition to fixing nitrogen in the soil. The Jim Jam experience and the "seeds for trees" program of Winrock and the Peace Corps demonstrate the potential and minimal cost of natural regeneration approaches. The replicability, however, of the Jim Jam experience has not been tested, and the "seeds for trees" program is just beginning to test the replicability of the pilot experience in an additional five rural councils. Both experiences (and others) need to be tested, studied, and lessons extracted to determine how to mount effective broadly based programs promoting natural regeneration.

Another promising approach to helping limit deforestation and declining vegetative cover to protect fragile soils is the use of improved wood-burning cookstoves. Improved cookstoves, both clay and metal, have demonstrated their capacity to reduce the amount of fuelwood used, cooking time and danger of burns, particularly to young children; the clay models in particular are easy to construct and repair. NGOs and other programs have demonstrated that it is relatively easy to train village women to make their own clay woodstoves and that a market exists for the metal woodstove made by artisans as well. The improved cookstoves are ready for diffusion but lack program support for widespread dissemination. Given the hundreds of thousands of families that use wood for cooking, even a conservative savings of 100 kilograms of fuelwood per year per stove would save the deforestation of thousands of hectares each year. Because reforestation programs rarely, if ever, add even a few thousand hectares of forest resources per year, the improved cookstoves have greater potential for helping balance fuelwood supply and demand, than do the hugely more costly reforestation programs.

Although natural regeneration holds the promise of being able to increase significantly the number of trees in field and pastureland settings, it too is not a solution for all situations. It is not a very effective system for

establishing boundary demarcations, windbreaks, or live fencing and would be a rather slow way to develop a woodlot where one does not presently exist. Although other promising approaches have been neglected, the need for agroforestry and reforestation programs involving nurseries and outplanting of seedlings will continue. The availability of seedlings, particularly of indigenous species, continues to be one of the important constraints to increased tree planting. A number of programs have had mixed successes establishing private nurseries, often because they find themselves trying to sell seedlings when government-run nurseries are giving them away. The government-run nurseries typically cannot meet the demand when a program promotes tree planting, but they do poison the environment for private nurseries. Yet, the government seems to find it politically unacceptable to stop producing seedlings. Perhaps a compromise would be for government nurseries to provide seedlings only for public works activities, that is, trees not intended for individual, family, or private sector ownership and use. This would perhaps help private nurseries to develop the (private sector) markets they need to be financially viable from year to year. Knowledge of grafting and access to plant materials for grafting would also help the viability of many nurseries.

Senegal needs to develop a natural forest management program that collaborates with local populations to manage public woodlands, pasture lands, and coastal areas, including protected areas. Most governments have come to understand that they do not have the resources to protect an area unless the local population living near the resources actively participates in its protection. This typically requires allowing local populations to also participate in planning activities for that resource and obtaining some benefits from its use. Although the entire Sahel used to look to Senegal for leadership in technology and new concepts, Senegal has become a regional laggard in many of these areas, including participatory natural forest management. Such programs provide a means of helping fight fraud and abuse of power, as well as neglect. It is hard to imagine that 2,000 immigrant families could have received "permission" to clear land in the Pata Forest if local communities had been involved in the management and decision-making process. Where long-established conflicts exist between local interests and government purpose, participatory resource management may not be an easy process. But, in most cases where such long-established conflicts exist, the resource has already been destroyed or seriously degraded to the point that little is left to manage. Undertaking a difficult process is better than just watching helplessly as the resources disappear.

Kolda, and particularly Tambacounda, are among the few regions of Senegal that still have significant forest areas that are not seriously degraded by human activity. These are the areas that would benefit most from natural forest management, and from an intensification of agricultural production. While their river valleys have the potential to support intensive agriculture, the majority of their land area is in marginal land with considerable relief, prone to water and soil erosion, and presently protected by extensive forests. Deforestation, however, will be followed rapidly by serious soil degradation. Although the total population in these regions is relatively small, the population per hectare of arable land is beginning to rival that in the much more heavily populated peanut basin. It seems likely that future population growth will quickly lead to deforestation of marginal and erosion-prone soils, leading to very rapid soil degradation. Senegal needs to undertake some of the types of programs discussed here to prevent Kolda and Tambacounda from experiencing a degradation of their natural resource bases as bad or worse than that which has been inflicted on the peanut basin.



Other areas of Senegal with relief and slope could also benefit from an intensification of water and soil erosion control. Although some fairly substantial soil and water control efforts have been undertaken in areas such as Kayemor, these techniques are still not used in many areas that face serious degradation from water borne soil erosion. Once again, a number of essential techniques are known, including: the use of rock dikes where rocks are available; the use of grass strips, vetiver or tree barriers, live fences or earth dikes where rocks are not available or the slopes are either shorter or less steep. Again the techniques seem to be available for diffusion, but dissemination of and support for the use of these techniques are limited. In areas where rocks are available, they are often found at some distance from the locations where they are needed and transportation is a significant constraint. The availability of plant material is often a constraint to the establishment of green barriers.

One of the few really impressive reforestation programs in Senegal is the dune stabilization program through the Nayas region and along the Great Coast. The program originally began during the Colonial Period, and many donors, including USAID, have contributed to the endeavor. Populations in the Nayas region have found their villages and oasis-like depressions under the threat of being obliterated by blow sand. They needed little persuading and few incentives to undertake reforestation efforts to stabilize the sand dunes and protect their homes and livelihood.

One other situation in which a similar response may occur regards land affected by salt intrusion along the rivers and tributaries that constitute Senegal's water courses. Thousands of hectares of productive land are threatened in this way along Senegal's many water courses. It needs to be determined if eucalyptus or other species can survive (more than a short time) and whether a green barrier does protect the fields from salt intrusion. If so, the technique should be developed and disseminated to help other rural producers facing a similar threat. Like the sand dune stabilization, this may be one of those rare instances where the benefits are so obvious and important to the local populations that only limited support will be necessary to achieve substantial adoption and impact.

On another note, little question appears to exist on whether Dakar and other major urban areas are facing serious pollution problems: poor sewage systems, limited collection and disposal of solid wastes, polluted surface water, poor control of industrial effluent, leaking of underground fuel tanks, and so on. Although pollution issues have traditionally been regarded as outside the range of USAID/Senegal's NRM/environmental programs, Senegal no doubt has significant and increasing programming needs in the pollution area.

# 1.0 Introduction

## 1.1 Objectives of the Impact Assessment

Within the guidance provided by the USAID/Senegal Mission, the purpose of this contract is to produce an assessment of the overall impact of the Mission's recently terminated AG/NRM strategic objective (old SO2<sup>1</sup>). The scope of work presented three general areas of activity for the assessment team:

1. *Conduct an impact assessment of AG/NR investments* from fiscal 1992 to 1998 to describe, assess, and analyze the results and impacts under the current country program strategic plan (CPSP). The programs funded under SO2 include:
  - Senegal Reforestation Project (SRP)
  - Kaolack Agricultural Enterprise Development (KAED)
  - Natural Resource-Based Agricultural Research (NRBAR)
  - Community-Based Natural Resource Management (CBNRM)
  - Conseil Supérieur des Ressources Naturelles et de l'Environnement (CONSERE)
  - Peace Corps (AG/NRM activities memorandum of understanding)
  - U.S. Geological Survey/Earth Resources Observation Systems (USGS/EROS) (environmental monitoring activities with support from the Centre de Suivi Ecologique)
  - Southern Zone Water Management (SZWM)
  - Winrock/On-Farm Productivity Enhancement Program (OFPEP)
  - NGO/PVO projects (Rodale Institute and other NGO-oriented NRM activities)
2. *Analyze knowledge, attitudes, and practices (KAP) data sets and the activity-specific data sets for fiscal 1992, 1994, and 1996* to identify plausible causes, reasons, purposes, and logic for the use and nonuse of improved AG/NR practices and technologies in communautés rurales, villages, and households, considering ecogeographic zones, distinguishing between the SO2-funded activity sites and those not funded by SO2.

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<sup>1</sup> The “old” NRM-SO2, which resulted from a fusion of two former SOs related to forestry and agriculture, was “to increase crop productivity through improved natural resource management in zones of reliable rainfall in Senegal.” In accordance with the proposed new Mission strategy, the NRM-SO2 was phased out on September 30, 1998, and NRM-related activities absorbed under two new SOS: (a) SO1, sustainable increases in private sector income-generating activities in selected sectors and (b) SO2, more effective democratic and accountable local government management of services and resources in targeted areas (the decentralization SO). References in this report to “SO2 ” are to the old AG/NRM SO, unless otherwise indicated.

3. *Collaborate with USAID/Senegal and the selected local contractor for the fiscal 1998 Knowledge, Attitudes, and Practices (KAP) Survey*, to be done at national as well as activity-specific levels.

The scope of work specified that the contractor would be responsible for the following seven deliverables:

- A. *Work plan and time line.* USAID/Senegal will work with the consultant team to develop a work plan. The work plan will discuss (a) roles and responsibilities for both USAID/Senegal and consultant team staff, (b) priorities, (c) how the team will accomplish deliverables, and (d) the time frame and sequence in which the deliverables will be completed. The contractor will provide USAID/Senegal with a work plan and time line schedule in English for implementing all components of the assessment for discussion and final approval by USAID by the end of week one of the contract.
- B. *Fiscal 1992, 1994, and 1996 KAP and Activity-Specific Data Analysis Report.* The contractor will provide an analysis of the three KAPs and activity-specific data. Ten copies each of the report in English and French will be provided by week eight or another time frame mutually agreed on by USAID/Senegal and the contractor, as per deliverable A. The contractor shall also provide two back-up copies on diskettes of the working tables created from the data sets. The revised information for the fiscal 1998–2001 R4 (results review and resource request) data tables will also be included (see deliverable G below).
- C. *Draft Life-of-SO2 Impact Assessment Report.* The contractor will provide USAID/Senegal with the draft assessment report in English and French (twenty copies each) by the end of week fourteen or another time frame mutually agreed on by USAID/Senegal and the contractor, as per deliverable A. The draft document will include a table of contents, executive summary, the body of the report, conclusions and recommendations, lessons learned, and appendices.
- D. *Oversee and comment on the Draft Fiscal 1998 KAP Report.* The contractor will assist in the fiscal 1998 KAP development process and provide written comments on the local contractor's draft fiscal 1998 KAP results and analysis report. The comments will be delivered in English and French (five copies each), within five working days of the date that the draft fiscal 1998 KAP results and analysis report is received by USAID/Senegal or another time frame mutually agreed on by USAID/Senegal and the contractor, as per deliverable A.
- E. *Critique of the final fiscal 1998 KAP report.* The contractor will provide a written critique of the final fiscal 1998 KAP report, a description of the fiscal 1998 KAP process, and an institutional capacity assessment of the local firm. This final fiscal 1998 KAP results and analysis report will be in English and French (ten copies each) and on diskette (WordPerfect 5.1/5.2) and cover KAP planning and implementation phases. The critique

will be delivered to USAID/Senegal no later than five workdays after the final KAP report is received from the local contractor or another time frame mutually agreed on by USAID/Senegal and the contractor, as per deliverable A.

- F. *Final Life-of-SO2 Impact Assessment Report.* The contractor will provide USAID/Senegal with the final report in English and in French (twenty-five copies each) no later than three weeks after comments are received from USAID/Senegal and partners (via USAID/Senegal) on the draft report or another time frame mutually agreed on by USAID/Senegal and the contractor, as per deliverable A. The final report will comprise a table of contents, executive summary, the body of the report, conclusions and recommendations, lessons learned, and appendices. The final report including annexes shall be submitted in hard copy and on diskettes in WordPerfect 5.1/5.2 in both French and English.
- G. *Fiscal 1998–2001 R4 Report for SO2.* The team will provide a six- to eight-page narrative summary of SO2 performance and impact, following the R4 guidance and format, accompanied by updated data tables. The results from the 1992, 1994, 1996, and 1998 KAPs<sup>2</sup> will be incorporated, as required, into the R4 data tables. This shall be submitted in both French and English in hard copy (five copies each) and on diskettes in WordPerfect 5.1/5.2 by the end of the fifteenth week or another time frame mutually agreed on by USAID/Senegal and the contractor, as per deliverable A.

## 1.2 AG/NRM Strategic Objective 2 (Old SO2)

The AG/NRM strategic objective was to:

- Increase crop productivity through improved natural resource management in zones of reliable rainfall (greater than 400 millimeters).

In 1995 this strategic objective was created from a consolidation of two prior SOs: (a) increased crop productivity in zones of reliable rainfall and (b) increased value of tree production. The two were fused in part to consolidate mission objectives in an era of declining resources and in part to parallel the Mission's transition from previous forestry programming (SRP) to the broader concept of natural resource management (CBNRM). NRM was expected to link income generation and the preservation and enhancement of the natural resource base more closely in the context of sustainable agriculture. Although the strategic objective has not been included as such in the 1998–2006 Country Strategic Plan, AG/NRM remains a cross-cutting issue in the new strategy. The Mission's new SO1 and SO2 are designed to build on lessons learned during the implementation of the AG/NRM strategic objective, and both SO1 and SO2 will continue to address AG/NRM-related issues.

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<sup>2</sup> References to KAPs for different years refer to fiscal years.

### **1.3 Impact Assessment Methodology**

The IRG assessment team integrated a number of different approaches in the assessment process:

National-level information indicates that the natural resource base in Senegal has been declining for several decades. Rainfall is significantly lower than during the 1950s and 1960s, population has increased substantially, and vegetative cover and soil fertility are in serious decline in many heavily populated areas. The team uses various sources of information and analytical tools to make linkages between these long-term trends and the impact of relatively short-lived program activities (in limited areas), which attempt to attenuate or reverse the impact of these long-term trends on agricultural productivity and the natural resource base.

The team uses geographic information system (GIS)–referenced results from USGS/EROS and CSE analysis of the national-level KAPs, and other secondary sources to assess changes in the natural resource base over time and the impacts of the AG/NRM strategic objective program at the national level.

The team uses analysis of project reports and evaluations and other secondary sources, field visits, and interviews with key informants in local communities, government institutions, NGOs, other donors, and the private sector. The team uses a rapid rural appraisal/participatory rural appraisal (RRA/PRA) to assess local impacts of the strategic objective programs in areas that benefited from program activities. Analysis of project reports and evaluations is the primary approach available for SZWM, because travel in the zone has become dangerous. It is also the primary approach used with regard to the NRBAR project, which has only recently been evaluated.

The team helped supervise and implement the 1998 KAP, which provides the context in which the SO2 programs are working and an indication of the changes in NRM adoption taking place across southern Senegal.

The team assesses the approaches of the different program activities, their relative impacts, effectiveness, sustainability, and replicability. The team also analyzes spread effects from the strategic objective–funded program activities through the use of project reports and evaluations and other secondary sources, field visits, and the RRA/PRA.

The team analyzes the costs and benefits of selected AG/NR practices from the farmers' point of view. This allows the team to assess which practices are sustainable and replicable on the basis of their financial and economic merits and helps explain farmers' behavior regarding adoption of practices. The cost/benefit analysis provides a basis to address issues related to the use of subsidies in program activities and make

recommendations about their use. It is also used to compare program costs targeting NRM activities with the farmer-derived benefits from those practices<sup>3</sup>.

The team implemented an RRA/PRA in a sample of villages that represent program intervention sites with positive and less positive results and neighboring villages that did not participate in program activities but where spread effects might be assessed. These visits focused on CBNRM and KAED, but also touched on Winrock (OFPEP) and the Rodale Institute. This RRA/PRA helps the team assess selected strategic objective programs and the perspective of the local populations regarding the programs and practices that they promoted and provides a firm basis on which to interpret the results of the KAP surveys and other secondary sources. The RRA/PRA also provides insights into why certain changes have or have not occurred<sup>4</sup>.

During the RRA/PRA activities, the team used an appreciative inquiry approach. The gist of this approach is to attempt to "catch someone doing something right" to determine which aspects of programs were successful or provided "proof of concept" and should be integrated into other USAID activities. Only after exploring the positive aspects of the program were informants asked to consider how it might be improved.

A final aspect of the methodology was a much stronger focus on CBNRM, the only continuing program originally financed under the AG/NRM strategic objective. Because CBNRM is only midway through the field implementation phase of its program, the team focused on the process as well as the impacts and has produced recommendations for a mid-course correction of the program.

The team looks at the contribution of AG/NRM strategic objective programs, particularly CBNRM and KAED, to improved democracy and governance (new SO2) and private enterprise development and income generation (new SO1) as well as synergies between the two. From these various sources and analyses, the team identifies findings and conclusions concerning the impact of the AG/NRM strategic objective and its contribution to the country strategy. The team also draws on these analyses to identify lessons learned regarding the different approaches of the programs, monitoring techniques and surveys, improving the diffusion of NRM practices and technologies, and enabling conditions that contribute to the successful adoption of NRM practices. The team also provides conclusions and recommendations regarding the linkages between the AG/NRM strategic objective program activities and the new SO1 and SO2.

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<sup>3</sup> Only a portion of the total program costs are used in the analysis, because most of the programs did not have the development and diffusion of NRM technologies as their primary objectives.

<sup>4</sup> The RRA/PRA provides an additional source of systematic analysis and the opportunity to ask questions in greater depth than is possible in a formal survey.

## **1.4 Organization of the Report**

The report is organized into ten chapters. The introductory chapter covers the objectives of the impact assessment, its methodology, and the organization of the report. Chapter 2 summarizes the impact of trends in the ecological and historical context of Senegal, particularly trends of declining rainfall, increasing population, the impact of structural adjustment, and changes in agricultural policy since the colonial period.

Chapter 3 presents the AG/NRM strategic objective in the historical context of the 1992–97 Country Program Strategic Plan and describes changes that affected the AG/NRM strategic objective in the course of that CPSP. These changes included a re-engineering process in 1996, resulting in a results framework with somewhat modified objectives and components. The chapter also describes targets, benchmarks, and indicators related to the monitoring of progress toward the accomplishment of strategic objectives.

Chapters 4 and 5 are the core of the report, providing an overview and summary of each of the eleven individual programs financed under the AG/NRM strategic objective and their impacts. Most of the programs have ended; CBNRM is the only one of the eleven that will continue for several more years. For this reason, annex F is a separate report on CBNRM, and the summary of impacts is drawn from the conclusions and recommendations of that annex. Chapter 5 attempts to provide more of an overall assessment of select individual interventions financed under the AG/NRM strategic objective in the past 10 years.

Chapters 6 to 8 summarize the conclusions and recommendations of three of the major annexes. Chapter 6 summarizes annex A, "The Technical Analysis of NRM Practices"; chapter 7 summarizes annex B, "Farmer-Perspective Financial and Economic Analysis of NRM"; and chapter 8 summarizes annex D, "Use of a Participatory Approach in Program Implementation Strategies." Chapter 9 summarizes the results of KAP 1998 and the analyses of differences between KAP 1992 and KAP 1998 that identify changes in the context in which these programs have operated.

Chapter 10 identifies some specific lessons learned from these experiences and conveys some specific considerations concerning how these experiences might help inform future USAID/Senegal programming, particularly regarding the new SO1 and SO2.

## **2.0 Historical and Ecological Context**

A description of the primary ecological factors affecting Senegal's natural resource base including land resources and land use, natural vegetation, forest status, and rainfall is presented in annex A along with a description of the effects of structural adjustment, macroeconomic policy, and agriculture/natural resource management (AG/NRM) policy from colonial times to the present. In the interest of space, only a brief summary of the effects and impacts of these various factors is presented here in the main report. Figure 1 presents a map of the major ecogeographical zones in Senegal, based on the NEAP. Figure 2 presents a map showing changes in rainfall decade to decade, because rainfall has had an enormous impact on the resource base and its productivity.

### **2.1 Results of AG/NRM Policy Changes**

The most obvious result of the changes in AG/NRM policy since Senegal began to undertake structural adjustment in the early 1980s is that basic agricultural services, which provide the enabling conditions for a productive and profitable agriculture, are presently not provided by anyone. The government has dissolved or otherwise eliminated the roles of the parastatal structures that were created to provide such services after independence. Most of the markets have been liberalized and monopolies and state control eliminated, but the commercial private sector, which was expected to take up the role of providing such services, did not respond. Almost 15 years after the government began to disengage from providing such services, the commercial private sector has still not made significant progress in filling the void, with the exception of traditional commodity marketing networks. For nearly two decades, most farmers have had limited access to credit, improved seeds, fertilizer, and extension services, yet people wonder why the production and productivity increases in the agricultural sector have stagnated. It is as if, in targeting one set of enabling conditions under structural adjustment and market liberalization, everyone has lost sight of the farmers' need for basic agricultural services (however they might be provided).

Until basic agricultural services (e.g., credit, agricultural inputs, marketing, and extension services) are again available to the majority of farmers (male and female) who are targeted by the narrowly focused AG/NRM programs, those farmers and the narrowly focused AG/NRM programs have little chance of increasing agricultural productivity or of having a significant impact on rural incomes. One must ask if economic growth can occur in rural Senegal in particular and Senegal in general until basic agricultural services are available to rural producers and the agricultural research and extension system functions in a reasonably adequate manner. Furthermore, one must ask how much one can expect farmers to invest in long-term improvements of their productive resources if that production is not profitable or is only marginally profitable in the short and medium term.



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Eco-Geographical Zones

Eco-Geographical Zones

## Historic Rainfall Maps

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Historic rainfall maps

Findings include:

- Most farmers do not have access to basic agricultural services such as credit, agricultural inputs (improved seed, fertilizer, and equipment), and extension services.
- In the 15 to 20 years since the government began its policy of disengagement, the commercial private sector has not stepped in to fill the void.
- Narrowly defined SO2 programs have had little chance to attain their long-term development objectives of increased agricultural productivity and increased rural income. Basic agricultural services, which are among the enabling conditions for productive and profitable agriculture, have not existed during the period in which the strategic objective was in effect.

Several important lessons appear to come from this experience:

- Narrowly defined programs are not sufficient to increase agricultural production and rural incomes unless those programs work in an environment in which the basic enabling conditions for a productive and profitable agriculture already exist.
- Disbanding parastatal organizations and market monopolies alone is not sufficient to entice the commercial private sector to take up the responsibility for providing basic agricultural services (or else 15 years is not long enough for that to take place).

## **2.2 Effects of the Historical and Ecological Context on Agricultural Production**

The agricultural sector, including forestry, livestock, and fisheries, accounts for a modest share of approximately 20 percent of gross domestic product and for 60 percent of employment. From 1978 to 1996, long-term growth of the agricultural sector averaged 2.0 percent, but agricultural sector production increased only 7 of the 19 years in question. Crop production recorded even larger swings, primarily as a function of good and bad rainfall years. Given the population growth rate of 2.7 percent (and even higher in past years), however, average per capita agricultural production has fallen over the 19-year period.

EROS estimates that the area under cultivation has expanded at approximately 1 percent per year (ignoring the decrease of land in fallow, which for EROS's purposes is included in cultivated area). Given the rapid decline in fallow land, the total increase in land cultivated may have approached the 2 percent level, similar to average long-term agricultural growth. Because this is less than the rate of population growth, however, the area cultivated per capita has declined from about 0.5 to about 0.3 hectare.

Other significant trends caused by changes related to structural adjustment have been the decline in the use of chemical fertilizers and the aging of farm equipment. Officially, the purchase of fertilizer was subsidized through December 1988, but use fell from a high of about 85,000 tons in 1975–76 to less than 30,000 tons

during the early 1980s and again following the depreciation in 1994. Fertilizer use fell even before the end of the fertilizer subsidy, at least in part because of other aspects of the government's disengagement from providing basic rural services. Effective access to such services as the supply of inputs (improved seeds, fertilizer, and agricultural equipment), credit to pay for the inputs, and so on was already on the decline.

In the absence of soil fertility amendments and measures to control soil erosion, traditional practices tend to exacerbate soil degradation. Particularly in the peanut basin, fields are cleared almost completely of any trees and other vegetation to allow easy use of animal-drawn equipment. Although a crust may form over the soil during the rainy season, this crust is broken to harvest the peanuts, leaving the soil loose and completely exposed. The combination leads to heavy soil loss by wind erosion during the harmattan season.

In addition to soil degradation caused by cultural practices, the expansion of cultivated areas and decline in fallow land have caused rural producers to place increasingly marginal land in production. With both the use of fallow and fertilizer declining, soil fertility and productivity in traditional farming areas has suffered. Although some farmers still have access to improved seed, particularly shorter cycle varieties, many do not. Given the low productivity of land and high risk of insufficient rainfall, many families try to limit labor inputs so that some family members can attempt to find off-farm income to supplement farm production and income. In part, this is made possible by the amount of falling land area available and cultivated per rural family member.

Clearly, one would have expected that the reduced use of these various factors of production, combined with significantly lower rainfall would result in appreciably lower agricultural production. By some estimates, the decline in rainfall alone might have been expected to reduce agricultural production in Senegal by 20–30 percent since the 1950–60 period. Given the reduced use of these factors of production, the expected decline would have been even larger. Because production has increased slowly at the rate of about 2 percent per year, it seems apparent that farmers have had some success in adjusting their production systems to address the effects of lower rainfall and both limited access to improved inputs and limited use of labor. It seems likely that a few key technologies, such as the use of shorter cycle varieties and natural soil fertility enhancements (manuring, compost, and *Acacia albida* field trees) have had a positive impact in avoiding the sharp drop in agricultural production that one would have predicted.

## 3.0 SO2 Background and Overview

USAID/Senegal has undergone a gradual transition in objectives and indicators in moving toward result packages for SO2.

### 3.1 The Original 1992–97 Country Program Strategic Plan

The overall goal to which the strategic objectives of the 1992–97 Country Program Strategic Plan were intended to contribute was "increased private income from natural resources." The strategic objectives were intended to contribute to subgoals of "increased value of marketed output" and "increased value of home consumption," whereas a population strategic objective helped contribute to "increased availability of natural resources per capita." Initially, the 1992–97 CPSP contained three strategic objectives related to agriculture and natural resource management:

- SO2: Increased crop productivity in zones of reliable rainfall
- SO3: Increased value of tree production
- SO4: Increased liberalization of the market

By the time that SO2 was discontinued in 1998, all three of these had been incorporated into a single AG/NRM SO.

Credit and democratization were among the targets of opportunity without specific SOs. The PVO/NGO Project was one of several that was expected to contribute to the strengthening of capacity of nongovernmental institutions to represent the interests of local communities. USAID documentation at this point did not yet use results frameworks and the terminology of key results. The objective tree for these three SOs is as follows:

#### I. SO2: Increased crop productivity in zones of reliable rainfall

- A. Ongoing projects:
  - 1. NRBAR
  - 2. SZWM
  - 3. KAED
  - 4. CBNRM
- B. Target 2.1: Increased soil productivity
  - 1. Decreased erosion
    - a. Increased windbreaks
    - b. Increased efficiency of watershed management
  - 2. Increased water infiltration

- a. Increased efficiency of watershed management
  - b. Improved soil structure
    - i. Increased organic matter
    - ii. Improved land preparation
    - iii. Increased agroforestry
- C. Target 2.2: Increased use of adapted technologies
  - 1. Stronger system to transfer technology
    - a. *Increased formal extension services (option rejected)*<sup>5</sup>
    - b. Increased private diffusion and commercial technology
    - c. Increased NGO and farmer organization diffusion
  - 2. Increase availability of adapted technology
    - a. Increased ISRA capacity to produce technology
      - i. Stronger links with international research institutes
      - ii. Increased research plan and management ability
      - iii. Improved financial/personnel management
      - iv. Increased adaptive research program
      - v. Increased farmer feedback
    - b. Increased NGO, farmer organization, and private sector trials
      - i. Stronger linkages with ISRA
      - ii. Improved training to conduct trials

## II. SO3: Increased value of tree production

- A. Ongoing projects:
  - 1. SRP
  - 2. KAED
  - 3. CBNRM
- B. Target 3.1: Plant more trees
  - 1. Increased availability of technology
    - a. Established a targeted forestry research program
    - b. Defined research agenda
  - 2. Increased incentives to plant trees
    - a. Increased demand for tree products
      - i. Established market information system
      - ii. Developed new markets
      - iii. *Established grades and standards (option rejected)*
      - iv. *Improved storage and processing (option rejected)*
    - b. Policy reforms

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<sup>5</sup> Options considered and rejected by USAID/Senegal are presented in italics.

- i. Deregulated tree products
  - c. Increased farmers' knowledge of the value of trees
    - i. *Mobilized NGOs and farmer organizations*
    - ii. *Developed extension service (Projet National de*
    - iii. *Vulgarisation Agricole) (option rejected)*
- C. Target 3.2: Increased conservation of trees
  - 1. Increased natural regeneration
  - 2. Protected new and existing trees
    - a. Improved legislation for protection
    - b. Improved protection policy
    - c. Increased community participation in management and protection of trees

### III. SO4: Increased liberalization of the market

- A. Ongoing projects:
  - 1. Rice Structural Adjustment Program
  - 2. PL-480 Title III (fiscal 1992–94)
  - 3. Banking Sector Reform Support  
(As target of opportunity for credit policy)
- B. Target 4.1: Increased private sector activities
- C. Target 4.2: Decreased government regulations
  - 1. *Rationalized exchange rate (option rejected)*
    - a. More effective intradonor and donor/GOS dialogue
    - b. Increased government/private sector dialogue
      - i. Stronger business associations
      - ii. Increased popular participation

## 3.2 Performance Indicators

The performance indicator for SO2 was to "increase production of cereals in zones of reliable rainfall from an average 1989–90 baseline level of 1 million metric tons to a planned 1996–97 level of 1.3 million metric tons. The benchmark indicators for the targets were:

### Target 2.1: Increased soil productivity:

An additional 45,000 rural households in regions of reliable rainfall adopt some form of technology to improve soil productivity by 1997.

## **Target 2.2      Increased use of adapted technology:**

An additional 45,000 rural households in regions of reliable rainfall adopt some form of improved agronomic practice or begin using improved inputs by 1997.

Unfortunately, ISRA activities, particularly under NRBAR, did not complete the adaptive research cycle. Composting, perhaps the most promising relatively new technology that directly improves soil productivity in the short term has not been adapted to the point at which it would be acceptable to rural producers. The availability and use of chemical fertilizer, improved seeds, and tools and equipment have declined due to the rising costs of imports and reduction in input supply services, which rural producers have faced since implementation of structural adjustment. The uncertainty of receiving adequate rainfall to produce even a moderate harvest makes many producers reluctant to invest in purchased inputs, even when they are available, and frequent poor harvests reduce producers' capacity to invest.

The disengagement of the government from providing basic rural services under structural adjustment, particularly the reduced role or outright dissolution of many of the regional development organizations, has greatly limited the means to extend and promote promising technologies to large numbers of farmers effectively. Improved crop production technologies would normally be diffused and supported in conjunction with extension programs focused on cash crops such as peanuts and cotton. Acreage of these crops has changed little since the 1989–90 baseline, but has declined by nearly 30 percent from previous decades.

The performance indicator for SO3, was to increase the value of tree production by \$2 million<sup>6</sup> annually in project areas by the year 1997, based on an increased income of \$40 per household for approximately 50,000 households. SRP statistics indicate that 160,000 persons participated in implementing tree-planting grants, but do not indicate the number of households or value of tree production. The cost/benefit analysis by Christopherson in annex B indicates that a 1-hectare plantation (in good condition) would average production of about \$100 per year. The approximately 4,000 hectares planted under SRP would fall far short of the \$2 million per year figure. Because grants tended to be largely in 0.5- or 1-hectare units, it would seem likely that only about 6,000 to 8,000 households actually participated in such grants. Thousands more may have participated in group activities, but knowledge of tree plantations did not seem to translate into establishing a tree plantation at the household level.

Benchmark indicators for the targets related to USAID's strategy for increasing the value of tree production included:

### **Target 3.1:      Plant more trees**

3,000,000 trees planted and surviving attributable to the USAID program by 1997.

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<sup>6</sup> Unless otherwise indicated, all dollar amounts in this document are U.S. dollars.



### **Target 3.2: Increased conservation of trees**

200,000 hectares of land protected and managed to permit regeneration of trees.

SRP alone planted more than 2.6 million trees on the 4,000 hectares that received cash reimbursements, although survival rates were only in the 50 percent range. It seems unlikely that any other USAID program made up the difference. Natural regeneration never really became a strong focus of SRP, CBNRM, or other large USAID programs. It is doubtful that the number of hectares protected and managed through project activities to permit regeneration equaled the 4,000 hectares planted. This failure to achieve more than perhaps 1 or 2 percent of the target seems to be related to (a) implementation through the Forestry Service, (b) Forestry Service priorities that favor tree planting, and (c) reliance on cost-sharing grants that provided little incentive for low-cost interventions. Changes in the Forest Code help provide the enabling conditions to increase the presence of field trees, but no large program effort has promoted and supported implementation of natural regeneration.

With regard to SO4—"increased liberalization of the market" for natural resource-based production—the focus was on efforts to increase private sector activity and to decrease government regulation. USAID/Senegal recognized that to accomplish this "is to buck Senegal's long history of centralized controls, paternalism, and suspicion of the market." It also recognized that "the private sector must develop the capacity to perform key production, marketing, and service functions to fill the gap left by the government's withdrawing from these activities" as a consequence of structural adjustment.

Benchmark indicators for the SO4 targets included:

#### **Target 4.1: Increased private sector activity**

Increased the number of private traders, transporters, and processors of cereals and wood products above a baseline to be determined by special studies carried out early in the CPSP period.

#### **Target 4.2: Decreased government regulation**

Privatization of marketing and pricing of rice and elimination of rice transport subsidies.

The benchmark for target 4.1—"increased private sector activity"—was later interpreted to pertain to the rice subsector, which was specifically the focus of deregulation in target 4.2. The effort to deregulate and privatize rice marketing and pricing was largely accomplished by June 1994. The number of wholesale rice traders, both Dakar-based and based outside Dakar, was reported to have increased substantially. The privatization of parastatals involved in the peanut subsector, as required under the World Bank/International Monetary Fund-supported structural adjustment program and USAID policy, had still not taken place in early 1999. The private sector has not developed the capacity to perform other key production and service functions to fill the gap left by the government's "disengagement" from providing such services.



### 3.3 Redesign

In 1995 the SRP program, which had been the only program that directly and exclusively addressed SO3, "the increased value of tree production," ended and USAID/Senegal proposed consolidating SO2 and SO3 to better focus declining resources. The new AG/NRM strategic objective statement became "increased crop productivity through improved natural resource management in zones of reliable rainfall. The principal indicator remained the productivity (in kilograms per hectare) of six select crops (including groundnuts). The following "targets," renamed "program outcomes," were retained:

- 2.1 Increased soil productivity
- 2.2 Increased use of adapted technologies
- 2.3 Increased income per compound from forestry products
- 2.4 Increased conservation of trees

No indicator was retained for program outcome 2.1, "increased soil productivity," given the ecological diversity and expense of measuring such indicators. Adoption rates of selected NRM technologies at the level of the multihousehold compound was the indicator for program outcome 2.2 "increased use of adapted technologies." Three indicators were retained for program outcome 2.3 "increased income per compound from forestry products": rural share of marketed value, per capita cash revenue in Kaolack, and per capita cash revenue in Kolda. "Trees per hectare on participating farms" was retained as the indicator for program outcome 2.4, "increased conservation of trees."

During 1996 USAID/Senegal spent a substantial amount of time and effort on re-engineering. The goal- and subgoal-level objectives remained essentially the same as originally stated in 1991:

**Goal: Increase private incomes from natural resources**

- Subgoal 1: Increase natural resources income per capita
- Subgoal 2: Increase value of marketed output
- Subgoal 3: Increase value of home consumption

In the re-engineering and redesign process, the market liberalization SO, "increased liberalization of the market for agricultural and NRM-based products" was "graduated." It had successfully achieved its operational policy reform objectives regarding the liberalization of marketing and pricing in the rice sector, and USAID/Senegal needed to rationalize staff in light of staff reductions. The few remaining elements of the market liberalization strategic objective were folded into the AG/NRM SO, resulting in the addition of the results under intermediate result "IR C1" below. What had previously been called "targets" or "program outcomes" in previous objective tree systems were now labeled "key intermediate results" (KIR), which in turn were supported by "intermediate results" (IR).

The results framework for the AG/NRM strategic objective consisted of the following KIRs and IRs:

**SO2: Increased crop productivity through improved NRM in zones of reliable rainfall**

- KIR A: Increased land investment
  - IR A1.1: Land tenure at the rural level secured
  - IR A1.2: Land investments secured
- KIR B: Improved NRM practices mastered and used by farmers
  - IR B1.1: Farmer exposure to improved NRM technologies increased
- KIR C: Increased access to commodity and input markets increased
  - IR C1.1: Transportation infrastructures improved
  - IR C1.2: Number of markets increased
  - IR C1.3: Market liberalization increased
  - IR C1.4: Processing and conservation structures developed
- KIR D: Increased access to capital increased
  - IR D1.1: Transportation infrastructure improved
  - IR D1.2: Credit and savings institutions improved.

SO2 included interventions focused on policy change, decentralization of NRM decisionmaking, implementation of targeted NRM activities, and the diffusion of NRM practices. As discussed between USAID/Senegal and USAID/Washington, however, the primary purpose of SO2 was to identify and establish an enabling environment for improved NRM in Senegal. In the final analysis, the critical outcome from SO2 is its contribution to the enabling conditions for AG/NRM technology use, improved planning and decisionmaking concerning land use and natural resource management, and increased economic choices. All of these do directly or will in time contribute to increased crop productivity, improved rural incomes, and a stronger civil society.

The 1997 results review and resource request (R4) indicates that the bulk of the SO2 resources and activities have been concentrated on KIR B, with few resources available for KIR A, C, and D. This seems to take a narrow view of the KIRs and their potential contributions.

### **3.4 SO2 Contributions to KIRs**

SO2 contributed to increasing land investments in several respects. Considerable progress was made at the national policy level with SO2 involvement in the 1994 and 1998 Forestry Code updates and the completion and approval of the NEAP. SO2 contributed to the implementing legislation of the Decentralization Law, which authorizes greater local-level decisionmaking for control and use of natural resources. CBNRM focuses on public planning and decisionmaking regarding the use of land and other natural resources. In this manner, it attempts to improve the enabling conditions for private land investment and use of *NRM technologies*, as well as to promote public and private investments to improve natural resources and their use through the use of NRM technologies.

Increases in *land investment* by women have been a notable success in SO2 sites. Women's groups have obtained access and improved usufruct to land. The increased knowledge and access to land has resulted in increased numbers of tree plantations and other long-term investments. Women have used the revenues from common field production to generate capital for revolving credit activities resulting in more political and economic power. Increased use of some NRM practices has also increased property values.

SO2 activities provided village-level groups *increased access to capital* through commercial credit and shared income from group enterprises (i.e., common fields, cereal banks, and woodlots). With access to capital and some basic training (literacy, financial management, and so on), local groups have established a range of successful enterprises (grain mills, gardening, cattle fattening, agricultural services, and so on). The Africare agricultural enterprise activity has helped establish commercial banking relationships that have been sustained even after formal termination of the program. This is a remarkable paradigm shift, which serves as a "proof of concept" for Senegalese farmers becoming viable and reliable business partners. Revolving funds for lending to individual members at reasonable interest rates are successful and have served to provide economic options, especially to women's groups, which were formerly marginalized. Women's groups have been particularly successful in credit-related activities and have established an enviable reputation for repaying their loans.

KIR C—"increased access to commodity and input markets"—was carried over from the old market liberalization SO. The market liberalization program achieved considerable success in liberalizing the pricing and markets in the rice subsector, but did not achieve the broader objective described in the 1992–97 CPSP of developing the private sector's capacity to perform key production, marketing, and service functions to fill the gap left by the government's withdrawal from these activities. SO2 activities addressed this objective only tangentially, primarily through KAED and other NGO programs. SO2, through the KAED activity, however, did demonstrate a way to *increase access* to commodity- and input-marketing services. This was accomplished through increased access to *capital*. Group credit facilitated the establishment of local GIEs, which provided agricultural and livestock input supply, cereal marketing, and cereal transformation services, while generating a profit for the enterprise. Although this approach has not been assessed on a large scale or integrated into a program with a focus broader than the village level, it indicates an approach that definitely bears testing.

Logically, if SO2 was intended to achieve impact primarily through *diffusion of NRM practices to rural producers*, it needed to include or have the support of some broadly based diffusion programs as well as have adapted and proven technologies to extend. SO2 has neither included nor had the support of such broadly based diffusion programs. Most of the SO2-funded programs focused on village-level activities, dealing with anywhere between a handful and several hundred villages. Some of these programs may have had a major impact on the target villages, but limited impact at a higher level of aggregation such as the regional or national level. CBNRM has a broader CR focus, but, to date, CBNRM activities directly affect relatively few hectares and households (production operations) and the resulting adoption of NRM technologies at the CR level is quite limited.

With the "disengagement" of the Senegalese government from providing basic rural services and the limitation of the World Bank's *Projet National de Vulgarisation Agricole* to only a pilot phase, SO2 has not

had the support of broadly based programs to diffuse NRM technologies, particularly at a level that might significantly impact aggregate crop productivity and rural incomes. The Institut Sénégalais de Recherches Agricoles (ISRA), particularly under NRBAR, did not complete the adaptive research cycle so that a number of the "improved technologies" that programs attempted to diffuse were not acceptable to farmers (for example, composting). With Senegal lacking a basic, adequate agricultural research and extension system, it is difficult to see how SO2 could have had a major impact at the aggregate level, based on the diffusion of NRM practices to rural producers. Rather, its greater impact has been its contribution toward establishing an enabling environment for AG/NRM technology use.

### **3.5 SO2 Performance Monitoring**

The monitoring of SO2 performance and impact has not been very effective. With the exception of CBNRM, SO2 programs did not do baseline studies at the beginning of their interventions. At the time of the impact assessment, CBNRM field activities had not been under way long enough to warrant a follow-up study to compare with the baseline. (Such studies are planned for three years after the baseline was done in each participating CR, and the first will be implemented in 1999.) So, at the time of the impact assessment, no SO2-funded program had done a normal comparison of the status in the program area with and without (before and after) the program. Most of the programs had done a single KAP-type survey at some time during the course of the programs. This allowed some characterization of the programs' target areas, but did not provide the means to assess the impact of the programs over time (before and after the program or even early and late in the program). USAID/Senegal has performed a KAP survey covering the entire zone of reliable rainfall biannually from 1992 through 1998. This survey was originally national, but was later reduced in scope to the zone of reliable rainfall to provide greater precision concerning those areas of interest to USAID/Senegal programming. The decision was made that it was preferable to have more observations and statistical reliability in the zone of reliable rainfall than to maintain a truly national survey.

The "national" KAPs focus on results at the level of the Senegalese administrative units referred to as the region or department. Most SO2 programs, however, had only a smattering of target villages in any one department, with the exception of CBNRM, which had only been implementing field-level activities for 2 years. (CBNRM typically does not target all of the CRs in a department at one time, and only beginning in 1999 will several departments have all of their CRs targeted by CBNRM.) The "national" KAPs were structured as random samples and did not stratify the samples to target participants in SO2 programs specifically to compare them with nonparticipants. The 1998 KAP was structured so that it could accurately capture a 5 percent change in NRM technology use at the department level. In most cases, however, it is unlikely that SO2 programs have worked directly with 5 percent of the households in any particular department. In the absence of broadly based diffusion programs to spread the use of technologies promoted by SO2 programs, it is unlikely that the SO2 programs could have increased NRM technology use enough at the department level to cause a statistically significant change, using these statistical methods. To identify smaller changes would naturally have required a much larger sample and greatly increased the expense of the KAP survey. The KAP surveys, thus, provide an interesting contextual background concerning rural producers and can possibly help characterize the adopters and nonadopters of NRM

technologies. But, the "national" KAP is not a very effective tool in attempting to assess the impact of SO2 or individual programs funded under SO2. For these reasons, the assessment of individual SO2 programs in chapter 4 makes little reference to the KAP results.

### **3.6 SO2 Performance Indicators**

The 1997 R4 identifies seven indicators identified in fiscal 1996 and consisting of the percentage of adopting farmers (later gender disaggregated to households and women) reported for each of seven NRM practices:

- Live fences
- Field trees
- Windbreaks
- Compost
- Manure
- Fallow
- Improved seeds.

The "national" KAP survey data indicate that, between 1992 and 1998, the percentage of households using each of these seven practices increased between a minimum of 4 percent and a maximum of 40 percent. Use of four of the seven practices has increased by more than 27 percent across the region of reliable rainfall. Although gender-disaggregated results beat targets in fewer than half the cases, this probably indicates highly ambitious targets as much or more than disappointing results. As mentioned above, however, it is difficult to correlate these multiregional statistical results with direct impacts that might have resulted from SO2 programs.

**Table 1. KIR-Level Indicator (NRM Practice Use)**

<b>RESULT NAME:</b> KIR B, Improved NRM techniques mastered and used by farmers							
<b>INDICATOR:</b> Percentage of households using specific NRM techniques							
<b>UNIT OF MEASURE:</b> Rural households							
Name of Technologies Used	Baseline (FY92)	FY94	Target (FY98)		Actual (FY98)		Percentage of household increase from FY92 baseline to FY98 Survey
	House-holds	House-holds	House-holds	Women	House-holds	Women	
Live fence	2.7	7	30	5	18.3	10.5	15.6
Compost	12.1	8	12	5	16.4	8.5	4.3
Improved seed	14.0	49	50	25	48.2	27.5	34.2
Fallow	15.3	43	55	35	50.5	27.5	35.2
Windbreaks	4.5	9	20	10	11.2	6.5	6.7
Manure	51.7	71	65	35	79.4	60.6	27.7
Field trees	2.4	14	60	40	42.6	22.6	40.2

Source: SENAGROSOL (1992, 1994, and 1998).

A May 1998 report by Christopherson and others<sup>7</sup> provides a detailed assessment of these seven indicators. Two of these, fallow and the use of manure, were found to be inappropriate because they are traditional practices that have been used for generations and on which program activities have little influence. Both are more influenced by macro trends in the agricultural sector and economy than by program activity. The use of fallow has declined from about 50 percent in 1965 to about 30 percent in 1990, as indicated in section 2.4, based on data from EROS and CSE, due primarily to population pressure. If the use of manure (and, to a lesser extent, composting) has increased, it is probably due at least in part to the increased price and lack of availability of chemical fertilizer. Many cash crop farmers had used chemical fertilizers fairly regularly until faced with the phasing out of fertilizer subsidies and increasing prices of import goods following devaluation. The availability of improved seeds has been seriously limited by problems at ISRA and by the "disengagement" of the government from providing basic rural services such as input supply.

Windbreaks and, to a lesser extent, live fencing are also difficult to use as indicators because of the problem of what constitutes a windbreak or live fence. The assessment team encountered a classic example when a young farmer being interviewed insisted that sixty-nine trees, planted 10 meters apart around part of a 1-hectare field was a live fence. The assessment team found an emerging tendency to demarcate field boundaries with trees, but in a somewhat haphazard manner that provided neither the benefits of a

<sup>7</sup> Christopherson and others (1998).



windbreak or live fence. It might have been better to classify all trees in and around the fields as field trees to avoid these problems of a practical definition.

## 4.0 Background and Overview of Individual SO2 Programs

### 4.1 Senegal Reforestation Project

The Senegal Reforestation Project prime contract officially operated from December 1987 through March 1995. The project purpose was to mobilize large-scale popular participation in tree planting with local and private resources. The project was to contribute to the goal of having a positive impact on the environment, economy, and agricultural production of Senegal.

The prime contract, originally for \$10 million and later increased to \$14 million, functioned as a host-country contract between Southeastern Consortium for International Development (SECID) with Virginia Tech as lead institution and Louis Berger International as a subcontractor and the Government of Senegal operating through the Forest Service. The contract was amended to extend the project about 2 years to serve as a bridge to the successor CBNRM program. This test program operated as a pilot project in three CRs in three different regions and was intended to evaluate the capacity of community-based institutions to develop, plan, and implement natural resource management activities.

SRP operated primarily through two field-level components. The matching grant component cofinanced tree-planting activities of individuals and local groups and operated through Forest Service staff. The roadside planting component operated in municipalities by contracting (on a cost reimbursement basis) with entrepreneurs to plant trees along major highways and access roads. Four other components—media, training, private sector promotion, and policy analyses—supported the field activities.

In the last two years, the SRP activities were reoriented under the test program to focus the matching grant component on promoting group activities and the roadside component on providing public works and public goods with limited cofinancing from the pilot CRs. An additional fund was added to provide the rural councils and Centre d'Expansion Rural Polyvalent (CERPs) with operating funds.

#### 4.1.1 Outputs

SRP produced some impressive outputs:<sup>8</sup>

#### Matching Grants

- The project executed 5,569 grants, of which 2,945 were reimbursed (exceeding the 45 percent minimum survival rate and the 2,846 target) and injected about \$388,000 into the economy.
  - A total of 6,800 hectares were planted, of which 3,889 were reimbursed (97 percent of the 4,000-hectare target).

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<sup>8</sup> Senegal Reforestation Project (1995).

- A total of 160,093 persons participated in the execution of grants and 242,486 persons were represented in the grants signed with the program.

### **Roadside Planting**

- The project planted 135 kilometers of trees before it was terminated
- Sixty-five enterprises and GIEs, forty of which were newly created, participated in the roadside planting program.

### **Private Sector**

- The project completed six studies on the promotion of private sector activities
- The project completed three studies on the strengthening of existing markets
- The project completed seven policy formulation studies
- The project participated in the preparation of regulations on private sector participation in the forest products industry for the new Forest Code.

### **Training**

- Six Senegalese completed master's degree training in the United States.
- Twenty-six persons participated in U.S. short courses.
- Thirty-eight persons participated in U.S. study tours.
- One hundred and fifty-five persons participated in third-country study tours.
- Twenty persons participated in third-country conferences.
- As many as 1,114 persons participated in local seminars and workshops in Senegal.

### **Media**

- A total of 319 products were disseminated through radio, television, the press, and informal channels.

### **4.1.2 Impacts**

SRP contributed to the establishment of 5,804 hectares of plantations and 1,042 kilometers of linear plantings (windbreaks and live fencing), of which 3,213 hectares and 576 kilometers respectively, received reimbursement and contributed to the nearly 4,000-hectare figure cited by SRP. These have undoubtedly provided locally important sources of poles and fuelwood as well as income for the owners. The final report does not indicate global tree survival rates, indicating only survival rates on the 55 percent of plantings that qualified for reimbursement. These surveys show a 74 percent survival rate nine months after planting and a 69 percent survival rate in 1994 for the slightly more than half the plantings that did receive reimbursement. Knowing that 45 percent of all plantations and linear plantings had survival rates of less than 45 percent, we must surmise that global survival rates were much lower than indicated in these surveys. A small indicative survey conducted during the impact assessment indicates that 1998 survival rates are in the

neighborhood of 36 percent on the basis of a sample that had a nine-month average survival rate of 59 percent. The 59 percent is certainly not out of line with what SRP figures might have fallen to, if they had included the nearly half of all plantations with survival rates of less than 45 percent (see annex D by Patrick Gonzalez).

Lacking true global tree survival rates, the percentage of area planted that received reimbursement provides an interesting proxy for survival rates that is available for the entire area planted by region and by year. The overall totals indicate that 55 percent of the total area planted and also 55 percent of the total linear distance planted had a survival rate above the 45 percent minimum survival rate required for reimbursement.

**Table 2. SRP: Area on Which Reimbursement Was Paid**

<b>Region/ Year</b>	<b>Area planted (hectares)</b>	<b>Area reimbursed (hectares)</b>	<b>Area reimbursed (percent)</b>	<b>Length planted (kilometers)</b>	<b>Length reimbursed (kilometers)</b>	<b>Length reimbursed (percent)</b>
St. Louis	134.3	106.2	79.0	135.9	113.0	83
Louga	316.7	127.2	40.0	113.4	32.8	29
Diourbel	267.5	114.8	43.0	109.1	43.0	39
Thies	1,057.7	686.8	65.0	205.1	131.0	64
Dakar	244.9	181.3	74.0	152.2	90.7	60
Fatick	609.8	335.9	55.0	31.4	16.7	53
Kaolack	814.4	335.4	41.0	122.1	51.0	42
Tambacounda	747.0	407.1	54.0	88.1	49.0	56
Kolda	680.6	348.5	51.0	24.2	16.3	67
Ziguinchor	931.4	569.8	61.0	60.5	32.7	54
1988	155.5	56.8	37.0	18.3	3.6	20
1989	569.4	331.7	58.0	95.7	44.2	46
1990	969.7	410.7	42.0	103.0	44.0	43
1991	1,263.0	706.5	56.0	203.8	111.3	55
1992	1,267.4	805.3	64.0	259.1	168.2	65
1993	1,579.3	902	57	362.1	204.9	57
<b>Grand Total <sup>a</sup></b>	5,804.3	3,213	55	1,042	576.2	55 <sup>b</sup>

*Source:* SRP, 1995, Final Report.

a. Totals for regions and totals for years are the same for each category.

b. Average percent length reimbursed.

The area on which the owner received reimbursement varies from a low of 40 percent in Louga to a high of 79 percent in St. Louis. One would expect an increase in survival in the southern regions that receive more rainfall. This pattern probably exists, if one assumes that St. Louis, Dakar, and perhaps Thies are somewhat special cases due to planting in areas with high water tables or access to irrigation. The pattern,

however, is not all that clear, given that Diourbel has higher reimbursement rates than Kaolack and Fatick has higher rates than Kolda or Tambacounda. On a yearly basis, it varies from a low of 37 percent in 1988 to a high of 64 percent in 1992.

The likely causes of these poor survival rates include drought, planting on extremely marginal lands, inappropriate choice of species, and poor maintenance. One can draw several lessons from this data:

- It is difficult to achieve an average of about a 50 percent survival rate in conditions across Senegal, even when a big cash incentive exists for people to do so.
- The de facto promotion of exotic species has not been successful in terms of survival rates.<sup>9</sup>
- In most circumstances, where feasible, it is a lot more effective and a lot less costly to protect natural regeneration than to promote tree planting. This would be true of natural forest management as well as protecting kadd and other multipurpose trees in farmers' fields.

The biophysical impacts of SRP are by far the most obvious in the Niayes region, where SRP was involved in sand dune stabilization to protect the depressions in which the local population grows vegetables and fruit crops. SRP is one of many projects since colonial times that have contributed to expanding the ribbon of *filao* trees (*Casuarina equisetifolia*) along the coast between St. Louis and Dakar. In that limited area, however, where SRP supported the local population in its quest to save their sources of livelihood, the project had a critically important impact. In addition, the trees are now reaching a size at which the population can begin lopping and selectively cutting some trees to provide poles and fuelwood. Local populations are sufficiently motivated here for tree planting to continue in the absence of SRP payments and other project support.

The other area in which SRP contributed to a major success with obvious biophysical impacts is the Thies region where it helped Kassim Ndour and others establish *Leucaena* windbreaks and live fences that serve to establish a microclimate for their irrigated fruit and vegetable production. The *Leucaena* is also used as a high protein supplement for livestock feed and source of high quality biomass for producing compost. Perhaps another 100 farmers in the area have now established a highly productive and profitable system that allow them to make an important contribution to the region's fruit and vegetable supplies.

The SRP final evaluation also identifies three important unintended impacts of SRP:

- USAID became a major donor in supporting the decentralization process in Senegal.
- SRP provided resources to enable USAID/Senegal to have a key role in environmental and NRM policy through the framework provided by CONSERE and the NEAP.
- The training component contributed to the evolution of the Forest Service to becoming more of a development agency and less of a policing agency.

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<sup>9</sup> Although project staff do not believe that they promoted the use of exotic species, participants interviewed claim that in some cases they were specifically discouraged from using local species (possibly for technical reasons), but were often told that seedlings were only available for exotic species.

### 4.1.3 Policy-Related Activities

SRP was involved in at least two policy-related activities that are important for NRM in Senegal. The first is the active role it played in revising the Forestry Code. Discussions about a new code were under way at the start of the project; questions concerning land and tree ownership, in particular, appeared to have an important potential impact on project success. In 1990 SRP funded a study by the Land Tenure Center that confirmed that the proposed changes in the Forestry Code would resolve many of the constraints identified by recognizing tree ownership rights of individuals and easing the process of acquiring permits. The Forest Code, enacted in 1993, still required anyone, including tree owners, to secure authorization of the Forest Service before harvesting and marketing trees or face serious penalties. SRP continued to work to ensure that the regulations for implementing the law would minimize potential disincentive effects of the new code on farm tree planting. The Forest Code has since been updated in 1995 and 1998, at least in part to reflect the changing role of institutions through decentralization.

The second SRP project paper amendment contained language calling for a natural resource policy framework, particularly an interministerial NRM committee with a functioning secretariat. This amendment was added in August 1993, several months after the Ministère de l'Environnement et de la Protection de la Nature (MEPN) was created. The amendment allowed USAID, following discussions with the new ministry, to fund the establishment of the Secrétariat Permanent du Conseil Supérieur des Ressources Naturelles et de l'Environnement (CONSERE). CONSERE was then tasked with developing the National Environmental Action Plan (NEAP) for Senegal, in response to the Rio Conference of 1992. Under the CBNRM program, funding was extended through the approval of the NEAP by a national seminar in September 1997.

### 4.1.4 Cash Payments

The government had previously depended on the public sector to execute its reforestation activities. The SRP project was designed to test the concept that tree planting could be encouraged through private investment if appropriate incentives were offered. This resulted in the project's cofinancing strategy of reimbursing a uniform amount (90 FCFA for field plantation spacing) for every tree surviving after nine months (later extended to twelve months and requiring a minimum of 45 percent survival to qualify), based on the estimated costs of preparation, planting, and maintenance<sup>10</sup>. Liberally interpreted, this implied paying people in cash to plant trees, even if that payment is delayed by some months.

As became clear in Patrick Gonzalez (1992), however, the results of SRP did not depend on private investment alone. Gonzalez documented that SRP results depended on about forty public sector programs to provide outright or subsidize the production of the seedlings and to do the basic village organization and extension work necessary to operationalize tree-planting activities in many or most areas where it operated. This point is repeated in the final evaluation of SRP:

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<sup>10</sup> The SRP reimbursement (cofinancing) rate was 40 FCFA for trees planted with 2 meter spacing (windbreaks) and 20 FCFA for trees planted at a spacing of less than 2 meters (live fencing).

Thus, matching grants relied on these other projects to provide technical assistance, credit, extension, and supervision to farmers and rural groups interested in tree planting. Matching grants, therefore, could not stand alone and had to be piggybacked or grafted on to projects and activities that provided the requisite framework. It is important to understand that without these other activities, the enabling conditions would not have been in place and matching grants could not have had the expected participation rate and impact.<sup>11</sup>

In effect, the public sector was still executing its reforestation activities and SRP was paying (cofinancing) the farmers to invest in what, in most cases, the public sector was already providing. The cost estimates used by SRP were rather high because they were based on the theoretical case of farmers buying them from private nurseries, rather than the typical situation in which plants were available at little or no cost from the Forest Service and project nurseries. This meant that the farmers received repayment for most, if not all, of their investment in the first year from SRP and later received the benefits of the activity already subsidized by other public sector programs.

SRP was originally applauded for proving the concept that incentives would encourage private-sector tree planting *in a manner that made public sector involvement no longer necessary*. The original subproject phase of the CBNRM program was based on this "proven" concept, even though the SRP final evaluation recommended that it not be used (thus, explaining some of the early operational problems of CBNRM, because they had no other projects to do the grassroots and village-level work for them). In retrospect, it seems unlikely that this concept was ever proven at all. Experience in other countries would seem to indicate that cash payments are not necessary but that some form of village organization work (community development activity) is necessary to facilitate local participation. Recent experience in CBNRM and other countries indicates that a better incentive is provided by linking NRM activities to activities that generate, maintain, or enhance an income stream (not a one-shot event) in the relatively short term.

#### **4.1.5 The Test Program**

The SRP program was extended for 2 years in August 1992 by Project Paper Supplement No. 2 to serve as a transition to a pilot project to test some of the key tenets of the proposed CBNRM program. The formal objective of the test program was to evaluate the capacity of community-based institutions to develop, plan, and implement natural resource management activities at the local level. The test program activities were undertaken in three pilot CRs in three different regions (Fatick, Kaolack, and Tambacounda); CRs were chosen, at least in part, on the basis of easy access from the regional Forest Service headquarters.

The departmental chiefs of the Forest Service in the test program zones were selected to assist and oversee the implementation of the test program activities. Specifically, the departmental heads have been key in supporting the CERP and the rural council management committee with logistical aid and technical and material support.<sup>12</sup>

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<sup>11</sup> SRP (1995).

<sup>12</sup> SRP (1995).

The focal point of the test program was the design and implementation of rural community-based agroforestry plans. These plans were developed by project and CERP personnel, using the "diagnose and design" methodology promoted by the International Centre for Research in Agroforestry (ICRAF). On completion, these plans were submitted to the rural councils for approval. Once approved, they served as the basis on which the SRP and CERP staffs, in consultation with the rural councils, developed annual work programs and budgets. SRP produced technical manuals that described the private- and public-sector natural resource management activities that would be supported under the test program. It also prepared a procedures manual describing the three funding mechanisms available: (a) private sector matching grants to provide cost sharing for NRM initiatives implemented by groups and individuals for their own benefit, (b) cofinancing tree-planting activities with the CR for public works projects that are destined to benefit the community at large, and (c) operational support for the CERP and rural council.

#### *4.1.5.1 Test Program Outputs (as of February 1995)<sup>13</sup>*

- A procedures manual was developed for use in the pilot CRs.
- A local agroforestry development plan was developed for each rural community.
- A total of 157 grants representing 126 hectares of NRM interventions was executed by more than 4,000 participants in 1993.
- Two public works contracts were executed: a 2-kilometer roadside planting and a 5-hectare plantation on saline soils.
- A total of 359 grants were signed representing almost 300 hectares of NRM interventions for 1994 (no available documentation on results).

The test program helped the SRP staff identify a number of key issues that were likely to affect the proposed CBNRM program:

The lack of material and logistical support for the CERP, particularly the lack of a vehicle

- The need for the management committees to be more representative of the entire community, rather than entirely dominated by the CR president
- The inability of both the project and CR partners to implement their accounting and financial management responsibilities in a timely manner, resulting in delays in reimbursing expenses, approving purchases, and providing project operating funds.
  - % Distance, poor mail service, and infrequent contact with staff was already a problem, even with local departmental offices of the Forest Service responsible for many of the financial management aspects.
- Questions about the ability of the CERP and the rural council to plan, develop, and execute a community-based NRM plan
  - % Lack of adherence to the priorities identified in the diagnosis process

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<sup>13</sup> No one has been able to find a copy of the test program final report.



- % Lack of coordination between the CERP and the rural council management committee
- % Incomplete reports and lack of understanding of the administrative procedures of the project.

Many of the questions raised by the SRP final report and final evaluation appear to be reflected in the changes made between the test program and the CBNRM program. These include:

- Redesigning the program to support decentralization as much as it supports NRM.
- Replacing the CR management committee dominated by the CR president with NRM committees (NRMCs), which consist of elected representatives of the numerous socioprofessional groups in the community.
- Revised accounting and financial management procedures, using the NRMC to manage the funds, providing extensive financial management training, and arranging the NGO ACA to provide technical assistance in financial management as well as periodic auditing.
- Establishing the animator position to ensure completion of activity reports on a timely basis and that they are quickly sent to the program office.
- Providing the CERP with a vehicle.
- Targeting women and particularly women's groups in allocating interventions and giving women and youth two representatives each on the NRMC. Requiring that women and women's groups be given official land use rights for land involved in interventions.
- Improving the capacity of local institutions through extensive training of the NRMC, CERPs, and animators.
- Adoption of the PRA approach as a basis for establishing the land use management plans.
- Use of private contractors to guide local institutions in the use of the PRA process and in developing the land-use management plans.
- Redesigning the private sector component of SRP to be a study (analysis) component that includes monitoring.

The SRP final evaluation, however, raises a number of issues and recommendations that appear not to be fully operational or are only partially reflected in changes between the test program and the CBNRM program. These include:

- The need to do more to develop bottom-up approaches that more effectively involve communities, groups, and individual participants. The evaluation team questioned the degree of participation of community-based institutions and village organizations in planning, designing, implementing, and financing agroforestry and other NRM activities in test program pilot Crs.
- The identification of profitability, participation, sustainability, replicability, and people-level impact as the factors that determine the achievement of CBNRM

objectives, (before it was changed to integrate the recommendation of targeting decentralization as much or more than NRM). It also identified the dependence of sustainability and replicability on participation, profitability, and people-level impact.

- Recommending that the matching grant approach not be used in the CR activities but be separated out and operate as before through Forest Service field offices in the Niayes and the Peanut basin
- Training villagers to participate in action research and participatory approaches
- The need to respond to community priorities, which were likely to include water
- The need for face-to-face communication, because surveys found that media campaigns had almost no impact on the rural population
- The need to broaden the range of NRM interventions beyond forestry alone
- The need to improve the operational efficiency in terms of providing funding on a timely basis and in accordance with the agricultural calendar
- The need to work with groups, even though this had proved less successful in the matching grant program, than working with individuals. (CBNRM continued working with individuals until it reoriented from the *microréalisation* approach to the subproject approach.)

In addition, the final evaluation team questioned the appropriateness of the Forest Service as an objective and disinterested entity to promote the decentralization process. In other words, it saw a contradiction in using a central institution applying a top-down process to implement the test program, which had as its objective to evaluate the capacity of local institutions to use bottom-up approaches to support NRM. For the sake of future programming, this analysis needs to be taken a step further.

From an institutional perspective, CBNRM remains a completely centralized organization (under the tutelage of a historically hierarchical and authoritarian institution, the Forest Service). It uses de facto strict definitions of NRM practices and top-down, imposed nonnegotiable procedures. Its objectives include modeling and facilitating a decentralized and participatory process in developing bottom-up approaches to NRM in numerous distant CRs. One must ask if the institutional setting, centralized structure, and inherent "organizational culture" are appropriately matched with the objectives.

## **4.2 Community-Based Natural Resource Management**

The CBNRM project was authorized in August 1993, and a cooperative agreement was signed with the Southeastern Consortium for International Development (SECID) in June 1994 to provide the long-term technical assistance team. Virginia Tech is the lead institution for SECID, and Winrock International is the major subcontractor. The program purpose is "to increase local community participation in the identification, planning, use, and conservation of natural resources." The program goal to which this should contribute is "to increase private sector incomes derived from the exploitation of natural resources,

consistent with decentralized, sustainable natural resource management." An additional subgoal is "to increase soil productivity."

#### 4.2.1 Outputs

CBNRM has had only two years of field-level interventions to date and is only beginning to generate some significant outputs. During fiscal 1997, CBNRM continued using the matching grant approach, similar to what was done in SRP. Six hundred applications were submitted, but 400 were rejected by the NRMCS without investigation, as not conforming to the priorities established in the land-use management plans (LUMPs). Of the 200 applications investigated, 146 were cofinanced. Although the fiscal 1997 annual report identifies the 146 *microréalisations* that were proposed, the fiscal 1998 annual report, unfortunately, does not report on the results obtained. The fiscal 1998 report only indicates that the 146 private sector *microréalisations* implemented under the matching grant approach in fiscal 1997 did not meet expectations because of their small scale and the fact that they were scattered and the distribution was not representative.

For fiscal 1998, CBNRM revised its approach and introduced the subproject approach, which uses a limited matching grant concept but only provides in-kind assistance, rather than cash payments. The outputs for 1998 were limited to activities regarding CBNRM's narrowly defined list of seventeen NRM practices, because agreement had not yet been reached with USAID/Senegal about whether credit would be made available to finance income-generating activities. Given these problems, the biophysical outputs of the thirty subprojects begun during fiscal 1998 were modest, even though they involved 1,980 men and 3,688 women for a total population of 5,668. The biophysical outputs remain heavily dominated by classic reforestation activities, particularly block plantations of eucalyptus, with only limited representation of broader NRM themes such as natural regeneration or the control of soil erosion caused by water:

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| • Field plantations               | 176 hectares  |
| • Fruit orchards                  | 5 hectares    |
| • Live fences                     | 10 kilometers |
| • Windbreaks                      | 14 kilometers |
| • Pasture enrichment              | 49 hectares   |
| • Improved fallow                 | 4 hectares    |
| • Green firebreak                 | 2 kilometers  |
| • Natural regeneration (assisted) | 24 hectares   |

In addition, more than 1,250 people, mostly women, have attended forty-two classes in functional literacy (and numeracy).

Beyond field-level activities, CBNRM has continued the SRP practice of providing significant training for project staff and other members of the Forest Service and MEPN.

Other accomplishments include the following: CBNRM has continued the tradition of involvement in Forestry Code policy begun under SRP. The Forestry Code was updated in April 1995 and again in

January 1998. CBNRM also continued support for CONSERE, begun under the SRP. The NEAP, which CONSERE was tasked to prepare, was presented to a national seminar for approval in September 1997 and officially accepted by the government in January 1998. CONSERE was also responsible for developing the National Action Plan for the Fight Against Desertification, which was approved by a national seminar in October 1998.

#### **4.2.2 Impacts**

CBNRM's initial impact in each CR is the development of a land-use management plan with significant environmental content. Although the development of these plans was not participatory in the first generation CRs, the process has become much more so in recent generations. In recent generation CRs, small teams consisting of NRMCM members, CERP staff, and private sector consultants spend eight to ten days going through a PRA process with each of eight to twelve different groups across the CR. These groups represent village clusters or an important central village and surrounding villages and hamlets, typically with several groups in each zone tentatively identified from preliminary information. The group results are aggregated to represent the results of zones, which in turn are aggregated to produce a global plan for the CR. In some cases the plans represent more of a wish list of everything the population would like someone to do for them. The results have been used primarily to propose NRM activities, whereas activities related to economic growth and income generation have sometimes been neglected. The information that goes into the plans provides a basis for regional planning at the CR level, which could be used by the government, donors, NGOs, and so on for planning activities in several sectors.

Although it would not be appropriate to claim that these plans constitute a landscape ecology approach or are the same as regional planning being advocated and implemented in USAID programs in other countries, they share a number of common features and objectives. It would seem appropriate to develop an active exchange between CBNRM and these other types of programs, which should each have something to contribute to the other.

CBNRM is beginning to obtain some significant impacts in the area of rendering operational the government policy of decentralization through the NRMCMs. These NRMCMs constitute a group of about 300–350 persons (in addition to the approximately 100 CERP staff and twenty animators) who have received a significant amount of training that has greatly increased their capacity to serve as representatives of civil society and address issues related to land use and community planning. These NRMCMs and their members are recognized and appreciated, particularly in the newer generations of CRs:

- For the wide range of groups found in the local civil society that are represented on the committees
- For the democratic procedures used to elect these representatives, including (a) the election of local representatives to subcommittees, then (b) the election of the committee member(s) from among the delegates representing a particular socioprofessional group from different zones, and also (c) the use of secret ballots
- For the accountability and transparency that characterizes their procedures.

In recent elections for the rural councils, several NRM members were elected in recognition of their skills and leadership qualities. And, in several CRs, the NRMCs were asked to help the rural council with its annual budget exercise. Recognizing these advantages, rural council members have started to request that they also be trained by CBNRM, and the program has planned several courses specifically for rural council members in the fiscal 1999 work plan. To the extent that rural council members are envious of accountability, transparency, and democratic procedures, this is certainly a positive impact.

CBNRM has established rules that automatically place at least a few women on the NRMCs, it also gives preference to women's groups with regard to functional literacy training and participation in the subproject interventions. Individual women have demonstrated competency as representatives of civil society and as officers of public decisionmaking bodies. This combination of increasing economic clout and personal capacity is beginning to change perceptions of and attitudes toward women at the local level.

Although the new Forest Code is still somewhat restrictive, Senegal now has a Forestry Code that at least allows people who plant or maintain trees to assume that they will be able to harvest those trees and benefit from their efforts. This step was crucial for the promotion and acceptance of many tree-related NRM practices. Senegal also now has national and regional action plans for addressing environmental issues and the fight against desertification, but any serious effort to put these plans into action is only now beginning.

The combination of SRP and CBNRM have provided years of training to MEPN and particularly the Forest Service. This training has targeted helping to change attitudes in support of foresters becoming more development agents and less policemen, introducing agroforestry, and so on. Progress has undoubtedly been made, but has been less than desired. Many, if not most, rural residents interviewed during field visits claim that little or no change has occurred in the behavior of forestry agents. Agroforestry and issues such as natural regeneration still seem to receive less support than they deserve (or receive in neighboring Sahelian countries). Senegal is decidedly a laggard in adopting approaches in which local residents participate in natural forest management. Given this situation, it is difficult for the impact evaluation team to identify a significant positive impact from all this training.

Perhaps the biggest impact that the CBNRM program is likely to have will be determined by the success of its attempt to prove the concept that programs can successfully target development interventions at the CR level, rather than at the traditional village level. Although CBNRM has certainly had some promising initial results, it is still too early to determine whether or to what extent that concept will be proven.

#### **4.2.3 Conclusions and Recommendations**

Conclusions are grouped as follows: (a) participation and people-level impacts, (b) program design problems, (c) CBNRM's relationship to USAID/Senegal, and (d) CBNRM operational problems. Recommendations are bulleted after each conclusion.

#### *4.2.3.1 Participation and people-level impacts*

1. Without access to credit to expand participation to include some critical mass of rural residents, the biophysical outputs and people-level impacts of the subprojects will remain quite modest, particularly relative to the size of the populations of the CRs, even if all the subprojects planned for the life of the program are successfully completed. If people-level

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The subprojects were designed without the participation of the persons and groups (e.g., federation) that are intended to implement them and without other grassroots-level representatives such as the zonal subcommittees. This would appear to compromise the chances that the population or even the organizations intended to implement the subprojects will buy in to their objectives, without which little sustainable impact will occur.

Given these two issues, the subprojects as presently constituted do not appear to be a particul  
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- CBNRM should take another look at subproject designs with the full participation of the relevant subcommittees and federations/promoters.
- CBNRM should do a mid-term evaluation of the subproject approach and its impact, particularly in light of the nonaccessibility of credit to participants.



- CBNRM should explore linkages with programs that do focus their interventions and interactions at the grassroots level and can help provide people-level impacts, for example, enterprise development programs such as those being formulated under SO1.
  - CBNRM should consider developing some easily accessible collaborative activities to complement the participatory approach, increase people-level impacts, and allow some "quick victories" in which the population reaps some benefits from collaborating with the program in the short run.
  - CBNRM should test some of these recommended approaches in the third generation CRs.
2. Kadd does not presently grow throughout the entire CBNRM intervention zone, and no one activity will provide a "quick victory" or *porte d'entrée* throughout the entire zone. The Jig-Jam Association<sup>14</sup> protection scheme, the "seeds for trees" program, and training women to construct improved cook stoves, however, are the types of activities that promise a "quick victory" for programs such as CBNRM and potentially greater people-level impact than the subprojects at lower cost. The NRMC, subcommittee, and federation structure would seem to lend itself particularly well to the type of land-use management activity that the Jig-Jam Association initiated in the Fissel CR.
- CBNRM should consider developing some activities bringing this type of "quick victory" as complementary to or substitutes for the present subproject program, particularly in the third generation sites.
3. Basic agricultural services, such as access to credit, agricultural inputs such as improved seeds and fertilizer, transportation, marketing, and extension services are not generally available to rural populations in Senegal. For CBNRM, access to credit is the most obvious condition necessary to enable its subproject strategy to provide people-level impacts. Without these enabling conditions, the link between exploiting natural resources and increased private sector incomes is tenuous; CBNRM will be impeded from making an important contribution to rural incomes, and it may have to change its strategy as addressed above. USAID/Senegal must share the burden of this deficiency, because the national situation existed at the time of program design and CBNRM has attempted to work with USAID/Senegal to address this problem.
- USAID and CBNRM may need to address changing the goal-level objective to something that is more realistic under existing conditions.
4. The decision to focus initially on establishing and training the NRM committees offers the potential of influencing other local institutions and the manner in which they operate, particularly the

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<sup>14</sup> Jig-Jam is a local association in existence since 1974 that is dedicated to rural development in the Fissel Rural Community in the Mbour region.

rural council. Nudging local institutions toward more accountable, transparent, and democratic behaviors would be an important impact.

The impact assessment team would like to see CBNRM facilitate greater participation of the lower levels of the representative structures that it has created, specifically the subcommittees and federations. This strategy is necessary because the representative structure created by CBNRM is unlikely to be perceived as truly representative of the population if the portions of that structure closer to the grassroots level are denied participation. But the impact assessment team recognizes that CBNRM had to start somewhere, and it can only do so much at one time. Developing sustainable local institutions to improve civil society is a long-term and difficult process.

- CBNRM should target the rural council for training similar to that provided to the NRMC members.
  - CBNRM should not voluntarily disband the NRMCs unless rural councils make significant progress toward becoming more representative of the different groups that make up civil society in the CR.
5. The effective training provided to the NRMCs has not trickled down to the subcommittee and federation level. These organizations, which are responsible for actually implementing the project's NRM and income-generating activities, have not received any capacity enhancement to date (although some limited training is scheduled for fiscal 1999). The subcommittees have the advantage that they do not compete directly with the rural council, because they are organized at the zonal level. One likely long-term scenario after the CBNRM program ends would be for the rural council and NRMC to merge and the subcommittee to take over a number of the NRMC tasks at a level one step closer to the population. All NRMC members are members of subcommittees, all rural council members are members of the subcommittee where they reside, and many of the federation members are also members of the subcommittees. A focus on the subcommittee would cover most of the representative structure created by CBNRM.
- Subcommittee and federation members/promoters should also be targeted for training similar to that provided to the NRMC members to facilitate this larger role in program activities.
  - CBNRM should consider making the subcommittees, which include the NRMC and rural council members, the primary target for program training in the third generation sites.
  - CBNRM should expand the roles of the subcommittees and federations in the entire range of program activities and particularly, for example, in the planning and design of subprojects for their subzones. They should also be targeted for training similar to that provided to the NRMC members to facilitate this larger role in program activities.
  - CBNRM should hold workshops to reconsider the subproject designs that include the subcommittees and federations or promoters responsible for implementing the activities.

6. CBNRM has few activities and limited interaction directly with the grassroots level (village and population). Part of the reason for CBNRM not having more direct contact is the attempt to work through representative structures (NRMCS, subcommittees, and federations) adapted to the program strategy to scale up the targeted level of intervention from the village to the CR. One might be fairly confident that the structures were acceptable to the population if they had developed from the ground up through a grassroots, town meeting type of participatory process. The fact that they were conceived by outsiders and established in a somewhat top-down manner raises the critical issue of whether they will be seen as representative of the population in the long run. It also raises the issue of whether an organization like CBNRM, which lacks such grassroots-level interaction, is the appropriate institutional base for facilitating the establishment (*montage*) of those representative structures.

- In the short and medium term, CBNRM needs to focus more on the subcommittees and federations, which are at the base of the representative structure that it has created.
- Subcommittees should be prepared for the role of helping the NRMCS implement many of its tasks at the zonal level, particularly pertaining to the roles of the *sensibilisation, animation, et vulgarisation* (SAV) and *gestion des ressources naturelles* (GRN) commissions.
- The design of zone- and subzone-level activities should be done with the participation of the direct representatives of those levels. Subcommittees and federations should be directly involved in the design of the subprojects that they will be responsible for implementing. They should also be more directly involved in the entire range of program activities.

7. Promoters need to acquire the skills to manage service providers, including gaining experience in the mechanics of bidding, developing, and signing contracts. The practical experience and confidence

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- CBNRM needs to allow the federations/promoters a larger role in the procurement of goods and services to allow them to gain experience in negotiating with and managing service providers.
8. Most if not all of the actors within the CBNRM program implementation structure face major problems in the distance and scale of their interactions. The project management unit (PMU) is trying to operate throughout most of southern Senegal from a single base in Dakar, and the majority of the target CRs are 500 kilometers or more from the base. In the larger CRs, with 100 villages or more scattered over hundreds or even several thousand square kilometers, the NRMCM has no way to get the message out to all of those villages with the structure and resources available. CERPs face problems similar to the NRMCMs, further complicated in most cases by the concentration of two to four target CRs in their zone of intervention. These problems of distance and scale are, after all, one of the primary reasons for decentralization.
- In the long run:
    - % Programs like CBNRM require a more decentralized organizational structure. The program would be better served by a structure in which it had a small one to three-person team in each region or in close proximity to one or two clusters of target CRs, where decisions could be made and support provided.
    - % CERPs should not be given responsibility to provide technical assistance to more than two target CRs, until the program is already well under way in those two.
  - In the short run:

- % CBNRM should expand the roles of the subcommittees and federations in the entire range of program activities and, particularly, delegate some of the communications and monitoring tasks to these lower levels of the representative structure.
- % CBNRM and its CR-level representatives need to develop a transportation policy that does not rely as heavily on the use of the CERP vehicle for accomplishing NRM, subcommittee, and federation tasks.

9 It is nearly impossible for the SAV and GRN commissions of the NRMCs to accomplish their assigned tasks with the resources available, particularly in the large CRs.

- CBNRM needs to decentralize a number of the tasks assigned to the NRMCs and work more directly with the subcommittees and federations. Structuring the subcommittees and empowering SAV and GRN commissions at the subcommittee level will not necessarily solve the problem, but will be an important step in the right direction.
- In the larger CRs, in particular, even SAV and GRN commissions at the zone level may need access to transportation to accomplish their tasks, even if this means simply having funds to rent a horse cart on a fairly regular basis.
- The subcommittees and federations need to be targeted in training activities to increase their capacity to take on additional responsibilities.
- CBNRM needs to create tools to operationalize participatory development at the grassroots level, particularly through the subcommittees and federations. A wide variety of tools can be used to help nonliterate populations understand and master complicated project processes.

- % The media section should expand its efforts to help provide some of these tools and training in their use.

10. Another important obstacle is the tendency to revert to traditional, top-down directive interaction, particularly when under pressure to implement activities over a large

scale within a limited time frame. Meetings between program representatives and the grassroots-level population often entail little discussion. Little information is provided on how a particular action or request fits in the context of past activities, the LUMPS, or the

priority problems and constraints raised by the population during the PRA. As a consequence, most villagers, and frequently even the promoters have no idea how a particular action or request relates to the development priorities of the C R , zone, or subzone.

Most of the work done under CBNRM is implemented by proxies, the NRMCS, CERPS, animators, and hired consultants. CBNRM has less control over these partners than it would have over program staff and can primarily influence their attitudes and behavior through training. Training alone, however, may not be sufficient to overcome long-ingrained cultural norms.

- CBNRM should establish a participatory protocol for visits to and interactions with collaborators. This protocol should relate to PMU visits to CR-level stakeholders as well as to visits of the CR-level program representatives to the zone, subzone, or village and include:
  - % A clear statement of visit objectives to all concerned stakeholders
  - % The relationship of this visit and objective to recent program activities and processes and overall program objectives. PMU- and CR-level representatives should consult the archives of the organization being visited to review the processes to date and how the current visit will further the objectives.
  - % Taking the role of a facilitator, that is, promoting discussion and analysis that helps the organization being visited to find its own solutions, rather than imposing an answer from the outside.
  - % Recording the visit in the organization's guest book and on tape if necessary.
- Adherence to such protocols should become part of the criteria for evaluating the performance of individual staff and program partners.

11. To date, CBNRM has avoided becoming too involved in some important local situations because of their political overtones. The most obvious case is that of the Pata Forest in the Kolda region. CBNRM cannot avoid the political issues and also remain relevant to the needs and preoccupations of the population.

- CBNRM should get involved in the Pata Forest issue and be an advocate in the Forest Service and the Ministry of Environment and Protection of Nature for addressing and finding a settlement of this issue.
- CBNRM should use its media section to prepare an audiovisual documentary on the situation in the Pata Forest for TV and radio diffusion.

#### *4.2.3.2 Program Design Problems*

12. The CBNRM program was designed within the context of structural adjustment and the government's disengagement from providing rural services. The lack of any provision to help local populations obtain access to credit seems to be a major design flaw. The project is unlikely to achieve significant increases in income for a critical mass of rural producers in its absence. If USAID/Senegal wants CBNRM and future related programs to have biophysical and people-level impact and to increase incomes, it will have to find some way to provide the target population with the basic enabling conditions for productive and profitable agricultural activities, particularly access to credit and other basic rural



services. Village groups, associations, and co-ops with access to credit and trained in functional literacy (including numeracy) and financial management have demonstrated the capacity to initiate the provision of some of these services in a profitable manner.<sup>15</sup>

- USAID programming needs to consider structural adjustment and its impact on the existence of enabling conditions for income-generating activities, particularly in the rural sector.
- In the meantime, USAID needs to explore ways to make basic rural services, particularly credit, available to populations targeted by programs like CBNRM, if it wants these programs to succeed in developing people-level impacts and increase rural income.
- USAID programming should explore the synergies between SO1- and SO2-type programs and the ability of rural and village co-ops to provide basic rural services.

13. The failure to recognize that credit would be necessary in the program design is closely related to the acceptance of the matching grant approach as both the incentive and the means to finance NRM activities. The SRP final evaluation report concluded that the matching grant approach was not appropriate for the CBNRM CR program and recommended that it not be used by CBNRM in that context. It would seem that the prognosis of the SRP final evaluation team has been largely born out by the CBNRM experience with the microréalisation activities. It does not appear that the matching grants will be any more successful in delivering biophysical and people-level impact to a critical mass of villagers in the context of the subproject approach.

The de facto use of a narrow definition of NRM practices has hindered CBNRM from addressing many of the problems and potential solutions developed in the LUMPs. This narrow definition results from the need to identify which interventions would receive subsidies under the matching grant program and in which the rationale for subsidies was to provide the rural population an incentive to adapt practices that were not profitable in the short term. The design, thus, on the one hand, insists that CBNRM follow a participatory process to develop LUMPs and, on the other hand, places CBNRM in a position from which it is difficult to respond to the demand-driven priorities that are identified in those plans. Divorcing NRM practices from the income-generating activities dissociates the NRM practices from the real priorities of the target population. It also appears that the matching grant system is biased against low-cost practices such as natural regeneration, because essentially no material and equipment cost exists to subsidize.

- Greater distinction should be drawn between activities that focus on public goods and those intended to benefit primarily individuals and small groups.

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<sup>15</sup> Primarily in the Africare/KAED program.

- Future programs should not use the matching grant approach for activities that target individuals, unless the program can be expanded to accommodate all households willing to participate.
  - The distinction between NRM and income-generating practices should largely be eliminated for activities that target either individuals or small local groups. Limited progress can be expected on the NRM front if no support exists for the income-generating activities that the NRM activities should be supporting.
  - The matching grant approach should be largely restricted to promoting activities that focus on public goods.
  - NRM activities for rural producers should be viewed largely in the context of enhancing or maintaining income streams from income-generating activities.
  - CBNRM should experiment with this new approach in its third generation CRs, for which field interventions have not yet begun.
14. The structure of the CBNRM PMU is at odds with the intended purpose of the program. Although CBNRM is intended to operationalize the government's decentralization strategy, it is designed as a totally centralized organization. It has one office in Dakar and no regional representation, even though all of the target CRs are in other regions and the majority are 500 kilometers or more distant. CBNRM has difficulty modeling a decentralized, bottom-up, participatory approach, given its own centralized structure and its institutional location under the tutelage of the Forest Service, which, although trying to change, remains somewhat hierarchical and authoritarian in nature.

Furthermore, the centralized structure is impractical, given that the majority of target CRs are 500 kilometers or more from the program office in Dakar. Many of the program's operational problems are related to this structure and the distances between the program office and the intervention sites. In cases in which an unplanned action must be taken quickly by the PMU staff to facilitate program implementation, the number of CRs and the distances between them simply overwhelm the program.

- In the long run, future programs should have a decentralized structure, and, to the extent possible, be associated with a less hierarchical and authoritarian institution.
- A single regional base in the Tambacounda area might help to reduce significantly some of the operational problems related to target areas near Tambacounda, Bakel, Kedougou, and Kolda. Such a solution, however, is still far from modeling decentralization. Establishing a small CBNRM staff team for each region or, perhaps, to be responsible for two clusters of target CRs would help improve the timeliness of program decisionmaking.
- The program needs to review the decisionmaking processes and determine where the responsibility for decisions can be delegated to partners or local program representatives.

- The PMU should avoid assuming greater responsibility for direct delivery of field services and should instead improve the CR-level technical and participatory development capacity.

#### *4.2.3.3 CBNRM Relationship to USAID/Senegal*

15. The recent history of relationships between USAID/Senegal and CBNRM has been a case study on how not to manage a program.

- USAID needs to establish a small four- to five-person steering committee to coordinate the USAID position and interactions with CBNRM. This committee might consist of one person each from SO1, SO2, AME, and the head office. All official Mission positions and requests should be communicated through this steering committee. Committee members should meet regularly with CBNRM program staff and be available to them to discuss the work plan and other operational issues.
- It would be useful to organize a regular or occasional issues-oriented forum in which both experience and concepts could be discussed in a collegial environment.

#### *4.2.3.4 CBNRM Operational Problems*

16. CBNRM has not always succeeded in managing unrealistic expectations of the local population. The manner in which the PRAs and LUMPs were done in the first generation sites contributed to these unrealistic expectations. The process

has improved in later generations, but the management of expectations still needs improving. Concern still exists that the 15-year LUMP is based on a wish list of everything the participants would like to have done for them and not a careful consideration of what the local

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- Facilitation and trainer skills should be included in the criteria for field-level personnel used by consultants in implementing the PRAs and preparation of the LUMPs and included among the skills taught to NRMC members.

- It would be helpful if program representatives continued to do occasional PRA-type activities at the village level to monitor program activities and changes in attitudes among the population.

17. During the fiscal 1997 and fiscal 1998 growing seasons, a number of the reforestation activities received their seedlings for planting at the end of the rainy season. In several cases, only a single rain followed the planting of the trees, and most if not all were lost. It appears that the same problem may arise again in fiscal 1999, given the

delays concerning the credit issue and the difficulty collecting the financial contributions for the subprojects. Villagers also report being discouraged from using certain species or having difficulty procuring them because they were not available from the nursery.

- CBNRM needs to develop a calendar of when nurseries must be started based on a date for planting the seedlings early in the rainy season. If seedlings cannot be



delivered by an appropriate (early rainy season) planting date, the activity should be postponed, rather than wasting the time and investment of the participants on an activity that has little chance of success.

- Nursery operators should be encouraged to provide a range of tree species to local growers. The program should consider facilitating access to seed from a wider range of species.
18. CBNRM has a highly centralized decisionmaking process, particularly regarding the design and approval of subprojects. This tendency to make most decisions at the level of the PMU is at least in part due to a lack of confidence in the proxies (the NRMCS, CERPs, and animators), through which the program works at the CR level. In a number of cases, this tendency is demonstrated by the PMU assuming greater responsibility for direct delivery of field services, apparently out of fear that it will not be handled correctly. The tendency to have PMU staff involved in details of service delivery and most decisions is neither operationally efficient nor empowering in the long term.
- The program needs to review the decisionmaking processes and determine to where the responsibility for decisions can be decentralized.
  - The PMU should avoid assuming greater responsibility for direct delivery of field services and should instead improve the CR-level technical and participatory development capacity.
19. Villagers and even promoters say in field interviews that they do not know what to expect from CBNRM, that they do not receive enough information, and what information they do receive from the program and its local representatives often presents mixed signals.
- CBNRM needs to make more information available to local participants in a form that they can use and understand. Important program documents need to be made available to participants in local languages, in both written and "spoken form," that is, recorded on cassettes. This should also include program agreements, all contracts, descriptions of important program initiatives and policy statements, summaries of interactions among program representatives at different levels and the clients with whom they interact, meeting minutes, and so on.
- % Under current law, contracts written in local languages may not be legally binding. In this case it may be necessary to prepare contracts in both the local language and French with the understanding that the French version will take precedent over the local language version in the case of legal procedures.
- At a minimum, such "spoken documents" should be provided to the subcommittees and federations or associations. They, in turn, should be encouraged and provided the equipment (tape recorder and cassettes) to provide similar documentation to their own clientele.

- The program should establish a participatory protocol for visits to and interactions with collaborators. This protocol should relate to PMU visits to CR-level stakeholders as well as the visits of CR-level program representatives to the zone, subzone, or village.
20. On a closely related issue, promoters and others involved with the program do not receive sufficient financial records from program representatives to maintain transparent accounting and financial records.
- CBNRM and its local representatives need to provide promoters and others with more complete accounting information and financial records, also in local languages or Arabic.

### **4.3 Senior Council for Natural Resource Management and the Environment**

The Senior Council for Natural Resource Management and the Environment (CONSERE) was established in August 1994 and consists of three entities with different functions:

- The Interministerial Council, a decisionmaking body presided over by the prime minister
- The Permanent Committee, a monitoring unit under the supervision of the Ministry of the Environment and Natural Protection
- The Permanent Secretariat, an implementing agency

Its purpose was to spearhead the development of Senegal's National Environmental Action Plan (NEAP) to serve as the strategic framework for environmental and natural resource management within the context of sustainable development.

CONSERE organized a national seminar of diverse stakeholders in February 1995 to launch a participatory and decentralized process to develop the NEAP. It resulted in:

- A consensus on the principal environmental problems
- Definition of the NEAP objectives
- Validation of the methodology proposed for preparing the NEAP
- Setting a calendar for preparing the NEAP.

In November 1995, CONSERE held workshops in all thirty departments of Senegal. The workshops focused on constraints, experiences, and financial mechanisms to support local initiatives related to NRM. Between April and July 1996, CONSERE had a survey administered to more than 5,000 persons with the purpose of broadening the diagnosis of environmental constraints and possible solutions. These activities resulted in regional environmental action plans for each of the regions of Senegal.

Multidisciplinary groups were also established to produce reports on the themes identified during the national seminar. The NEAP report is a synthesis of both the thematic and ecogeographic investigations. The report was presented to and approved in September 1997 by a national seminar including representatives from nearly 250 stakeholder organizations. The NEAP was approved by national authorities in January 1998.

USAID funding ran out in December 1997, following the national seminar that approved the NEAP, and CONSERE moved its offices to the Ecological Monitoring Center (CSE). This facilitates CONSERE's role in supervising environmental monitoring, although it may be less than ideal for some of its other functions. CONSERE received approval of the NEAP by national authorities shortly after the funding ended.

The national seminar held in February 1995 to launch the NEAP process was also used to initiate a first contact with stakeholders concerning a National Action Plan for the Fight Against Desertification (PAN/LCD). Following similar principles of participation, a series of studies and consultations were developed. Most collaborative activities were channeled through national-level socioprofessional associations. A study group was established, and the CSE helped CONSERE establish an information system on desertification. A methodology workshop was organized in August 1996 to promote collaboration of the various stakeholders and insure a coherent process. Activities included a number of workshops and forums, a media campaign, and the use of printed and audio materials in local languages.

The PAN/LCD was approved in August 1998. In December 1998 CONSERE and CSE were host for the International Conference for the Fight Against Desertification, with some 2,000 participants from around the world.

USAID was able to promote the development of the NEAP with an investment of about \$400,000. The institution it helped establish for this purpose, also received funding from UNDP and has also developed the PAN/LCD. Whether CONSERE has the resources and is properly positioned to play an active role in coordinating and implementing the NEAP remains to be seen. The development, however, of the NEAP in Senegal has probably cost USAID considerably less than in many other African countries.

#### **4.4 Peace Corps Memorandum of Understanding**

The Peace Corps memorandum of understanding (MOU) financed under CBNRM has not resulted in much interaction between the Peace Corps and CBNRM program activities in the CRs. The CBNRM project and the Peace Corps had difficulty agreeing on a role for volunteers and the numbers to be involved. At one point, it was proposed that volunteers serve as the CR-level animators, focus on small enterprise development, and so on. When no real agreement emerged, the Peace Corps began to identify areas where Peace Corps and CBNRM programs converged. This resulted in the decision to ask USAID to allow the Peace Corps to use the funding to establish agroforestry demonstration activities that would reinforce the Community Training Center (CTC) program. CTC trains local community members in agriculture, agroforestry, small enterprise management, and health. The Peace Corps thought that these centers could be used by CBNRM to implement an important part of its training program. But that has never developed.

CTCs are located in the towns with department-level government functions. Bandafassi is the only CR selected by CBNRM that also has a CTC. Although the CTCs have trained more than 1,000 members of local communities, not much of a relationship has existed between the centers and CBNRM; neither have Peace Corps volunteers been involved in CBNRM activities.

The Peace Corps with Winrock is just beginning a new program in six CRs, including Bandafassi, called "Seeds for Trees." The program promotes natural regeneration by providing improved seeds to plant a field or area where a farmer agrees to not cut all of the young trees when she or he clears the field. Most are not protected physically, but the pilot program in Thienaba demonstrated that the combination of incentives, raising awareness, and not cutting trees when fields are cleared is sufficient to increase the number of field trees significantly within several years.

Questions may exist on whether Winrock and the Peace Corps have the capacity to develop this program in other CBNRM CRs or whether the supply of improved seeds is adequate to promote this type of activity on a larger scale. Little question exists, however, that this type of program would allow CBNRM to provide some concrete benefits to local participants cheaply and in a manner that has the potential to produce significant biophysical NRM results. It seems like the type of program that CBNRM and future strategic objective activities should investigate closely. Perhaps SO1 can help facilitate an expansion of the seed supply.

Overall, the Peace Corps received about \$250,000 from CBNRM. The money appears to have been put to good use, but, unfortunately, no cooperation or collaboration with the CBNRM program has occurred to date.

## 4.5 Environmental Monitoring (United States Geological Survey and Centre de Suivi Ecologique)<sup>16</sup>

In 1993 USAID/Senegal in conjunction with U.S. Geological Survey's (USGS's) Earth Resources Observation System (EROS) Data Center initiated a "Framework for Long-Term Monitoring of Senegal's Natural Resources." This program sought to exploit baseline data on land use and vegetation cover collected by EROS in the early 1980s. The project was initially set up in late 1993 with start-up funding through the Senegal Reforestation Project (SRP). Later, additional cofunding was provided through the Community-Based Natural Resources Project (CBNRM) and the United States Geological Survey (USGS).<sup>17</sup> The dual and complementary goals of the project are to develop:

- An independent and sustainable resource-monitoring system for Senegal in partnership with the Ministry of the Environment
- Research methodologies for tracking certain natural resource management indicators pertinent to USAID's NRM SO.

More specific objectives include:

- Develop techniques and a framework for long-term monitoring of Senegal's natural and agricultural resources using a three-tiered approach:
  - % Ground-based monitoring
  - % Aerial monitoring

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<sup>16</sup> Drawn primarily from annex E, by Malcolm Marks.

<sup>17</sup> Wood, Tappan, and Jacobs (1995).

% Satellite-based monitoring and mapping

- Document and seek to understand better the long-term biophysical changes and relationships with human activities.
- Training and transfer of technology to the Centre de Suivi Ecologique.
- Provide environmental change information to policymakers and enhance public awareness of the environment.

During the early 1980s, USGS, with support from USAID/Senegal, participated in the appraisal of Senegal's natural and agricultural resources and the production of national land use and vegetation cover maps under the Plan National d'Aménagement de Territoire program. In the same period, USAID/Senegal supported the Plan National d'Aménagement de Territoire, during which the natural and agricultural resources of Senegal were appraised and land use and vegetation cover maps were produced. USAID's support was provided through the activities of a team from USGS. In 1983 and 1984, as part of the standard process of image classification and verification, USGS team members visited approximately 600 predefined sites across the entire country. A standardized procedure was followed in which each site was photographed and information collected on their biophysical and edaphic characteristics.

Although the data were collected primarily to serve immediately in the processes of image classification and map making, they also serve today as a unique data base of the state of Senegal's natural resources from almost two decades ago. In the early 1990s (i.e., 10 years later), USAID, in conjunction with USGS and EROS, realized the potential of the original data base for serving as valid baseline data, both as a means of quantifying the rates of natural resource evolution over time and by area and for understanding the mechanisms of observed changes.

Further activities that capitalize on the competence of EROS Data Center have been added to the original agenda and these include:

- Use of Corona and Landsat imagery to assess natural resource changes in the past thirty years
- Experimentation on the applicability of aerial videography for the monitoring of USAID's indicators of natural resource practices
- Cooperation with CONSERE during the development of the National Environmental Plan of Senegal
- Capacity-building assistance to CSE
- Socioeconomic studies for assessing causes and effects of observed natural resources evolution in Senegal.

In line with the first goal, the EROS team has worked principally in cooperation with CSE, itself a renowned center of environmental monitoring excellence in Africa. Some limited assistance has also been provided to CONSERE during the production of the NEAP and to the Institut des Sciences de l'Environnement of the University of Cheikh Anta Diop, Dakar.

Cooperation with the CSE has taken the form of joint monitoring operations (both of environmental and socioeconomic variables) using remote sensing and ground-based monitoring techniques. The involvement with CSE has led to the transfer to the latter of considerable amounts of environmental monitoring competence and capacity building both by on-the-job training and formal competence development. CSE has benefited only minimally from direct financial assistance.

The long-term monitoring of natural resources was recently complemented by the unexpected declassifying by the United States of high resolution satellite imagery from the early 1960s, which has allowed some important comparisons to be made with more recent images.

The second goal of the Long-Term Monitoring of the Natural Resources of Senegal Project has been to investigate the use of alternative tools for the monitoring of certain NRM indicators, particularly of land-use management practices. Airborne videography has been tested in particular and would appear to provide a convenient and relatively cost-effective method to obtain large amounts of information on certain NRM practices. EROS has also mapped the adoption rates of NRM technologies by CR from KAP data in collaboration with this impact assessment team. This is another step toward helping to render that data on the NRM context in Senegal more useful and understandable.

Unfortunately, for the purposes of this evaluation, EROS has not yet completed its final report, and, therefore, the final product regarding mapping the present status of natural resources and the environment in Senegal and trends and changes over time is not complete. Most of the maps and information used in this report concerning the ecological context (chapter 2), however, are borrowed from EROS presentations or ongoing work on their final report. Some of the trend maps and graphs, such as those on rainfall, deforestation, and vegetation cover, and the projections of land cultivated seem to have had an impact on all who have seen them in recent presentations.

EROS has made great progress on their four specific objectives and their original goals. It would appear that the \$1.6 million funding from CBNRM was money well spent and that it would be in the interest of Senegal and USAID/Senegal to continue the experience. A significant transfer of capacity appears to have been made to the CSE, which makes it more promising that CSE could become the central hub in a system providing geographic and environmental information to other government and regional agencies. Such a hub would be a considerable resource to Senegal and the region.

#### **4.5.1 Recommendations for Further Activities**

Many areas of interest have developed from EROS's work in Senegal and particularly that which has involved the CSE. Some areas that should be investigated further are provided below:

- CSE should be assisted in becoming a central hub for geographic and environmental information, serving national and potentially regional agencies.
- Future and continued monitoring of PNAT and CSE field sites requires much reflection and planning. This should include the development of a future monitoring program, the classification of PNAT sites based on proposed monitoring

frequency and the reinforcement of the socioeconomic studies at the sites. It will be necessary, however, to discuss the modalities for future monitoring work if CSE is to be the main player in this field. In-depth consultation between USAID/Senegal, EROS, GOS, and CSE will, thus, need to be undertaken in the near future.

- USGS should investigate the possibility of continuing to provide advanced training in GIS software (Arc/Info and Arc View) to CSE technicians. Means of supporting CSE's own GIS training program could also be investigated.
- EROS should study the possibility of using aerial videography for monitoring the distribution and density of Senegal's livestock. Tests could be carried out using already registered videotapes and sampling/statistical methods.
- EROS should investigate with CSE the possibilities of better exploiting CSE's field site data bases as well as their large collection of aerial point photos.
- EROS should help CSE to begin the investigation of Senegal's aerial photo archives as a means of pushing back the natural resources baseline to at least 1945.
- Potentially, one of the most important aspects for EROS and CSE's future cooperation should lie with the continued exploitation of their dramatic environmental change exhibition (a PowerPoint demonstration). It should continue to be developed for government, regional, and donor use, and it would appear logical to suggest that exposure of the exhibition to the nation's major religious leaders could lead to a positive impact.
- After 5 years cooperation with EROS, a mechanism should be investigated that will provide CSE with a far more "equal partner" status in continued scientific cooperation.

## **4.6 Kaolack Agricultural Enterprise Development Program**

The Kaolack Agricultural Enterprise Development (KAED) program was designed by Africare as an unsolicited proposal and submitted to USAID/Senegal in July 1992. USAID/Senegal agreed to provide \$8 million in funding for the cooperative agreement, signed in September 1992. The program's goal, presented in its multiyear plan, is "to increase incomes through the use of sustainable agricultural production techniques and investment in viable agriculture-based enterprises." The program's purpose is to establish and/or support viable agricultural and agroindustrial enterprises in the Kaolack region, which utilize environmentally sound practices. The program strategy for attaining these objectives included:

- To increase the skill and knowledge base of program farmer groups
- To facilitate and promote more productive participation in rural development activities by women's groups
- To establish demonstration fields for training in natural resource management
- To provide access to financial services to the program's agriculture-based enterprises

- To complement physical, human, and/or financial resources controlled by agriculture-based enterprises by providing essential infrastructure, equipment, and materials.

Africare expected the KAED program to assist client groups to start up and operate viable, sustainable, and profitable agriculture-based enterprises in the short term. In the long term (5 to 15 years), it expected the training, demonstration, and technical assistance to lead to farmers adopting improved agricultural and NRM techniques, which would increase yields.

The Africare approach was participatory in the sense that the client population was a real partner in decisionmaking at every stage of the development process in their villages. A major emphasis was placed on facilitating a process in which clients take control of their own development and achieve the goals they set for themselves. A participatory approach was not always taken to its logical conclusion, however. A PRA approach was used to identify the most appropriate type of enterprise for a village, but only within the narrow range allowed by the predetermined list of activities that KAED would finance. KAED project staff took responsibility for procuring much of the capital equipment (mills, wells, and so on). This resulted in missing the opportunity to provide members with experience in those very important aspects of enterprise management related to procurement, establishing contacts with suppliers, and managing contracts in a transparent manner. Informants could not describe how they would procure replacement equipment, for example, a new grain mill, even though they had already saved a substantial portion of the capital necessary to do so.

The KAED program reportedly got off to a slow start. Most of what it has accomplished has been done during the short period between 1995 and 1998. For example, the first two loans were granted in November 1995, seventy-seven were granted between the beginning of 1996 and September 1998 and fifteen between September and December 1998, after the project officially ended.

#### 4.6.1 Outputs<sup>18</sup>

##### **Small-Scale Enterprises** (*number*)

Enterprises (GIEs) developed	56
Women's agriculture-based enterprises <sup>19</sup>	22
Market gardening enterprises	8
Livestock production enterprises	19
Grain marketing enterprises	14
Grain mill operating enterprises	14
Grain threshing enterprise	1
Participating members	2,851
Female members	2,085

<sup>18</sup> Africare/Senegal (December 1998), KAED Project Final Narrative Report.

<sup>19</sup> This category overlaps with the other categories, thus, the list does not total to 56.



Male members	766
<b>NRM Practices</b>	
Demonstration fields (4 hectares each) developed ( <i>number</i> )	56
Compost produced ( <i>cubic meters</i> )	1,448
Village tree nurseries established ( <i>number</i> )	65
Length of windbreaks established ( <i>kilometers</i> )	132
Length of live fences established ( <i>kilometers</i> )	37
Length of rock dikes established ( <i>kilometers</i> )	0.5
Length of grass strips established ( <i>kilometers</i> )	1.7
Improved cook stoves built ( <i>number</i> )	973
<b>Training (<i>number</i>)</b>	
Functional literacy classes sponsored	72
People receiving functional literacy training	1,297
Men receiving functional literacy training	962
Women receiving functional literacy training	335
Women receiving human resource training	40
Women receiving technical training (agriculture, NRM, and accounting)	2,684
<b>Infrastructure contributed by KAED (<i>number</i>)</b>	
Grain storage buildings (100 tons each)	14
Grain mills	14
Cemented wells	30
Water pumps	27
Cemented water basins	81
Livestock enclosures (stables)	19
<b>Loan Summary January 1999</b>	
Loans ( <i>number</i> )	94
Loans given during the course of the KAED project	79
New loans since the project closed in September 1998	15
Enterprises receiving loans ( <i>number</i> )	42
Total loan amount ( <i>FCFA</i> )	304,345,000
Repayments and receipts ( <i>cumul des exigibles</i> ) ( <i>FCFA</i> )	334,253,538
Outstanding loans ( <i>FCFA</i> )	89,883,228
Loans repaid or delinquent ( <i>FCFA</i> )	214,461,772

Amount of delinquent loans (7 of 79 KAED loans) ( <i>FCFA</i> )	6,976,051
Loans delinquent ( <i>number</i> )	7
For animal fattening	5
For cereal marketing	2
For which continued payment is being made	3
For which no payments have been made since September 1998	4
Delinquent loan amount as a percentage of total loan      amount due	3.2
Calculated repayment rate ( <i>percent</i> )	96.8
Enterprise members who received internal revolving fund loans ( <i>number</i> )	2,054
Female	1,867
Male	187

#### 4.6.2 Impacts<sup>20</sup>

##### Cereal Milling Enterprises

Cereal milling enterprises were being managed successfully; financial management includes saving money to maintain equipment and purchase a replacement mill when that becomes necessary.

##### Revenue allocation (percent)

Mill operator salaries	25
Equipment maintenance fund	25
Amortization of the existing mill	50

By early 1998, several of the more successful milling enterprises had saved nearly \$1,500 or almost half of the cost of a replacement mill. The milling operations operate all year long, provide permanent employment for one or more mill operators and intermittent work for local mechanics, are relatively high margin enterprises, and require constant involvement by their members, which reinforces the training provided by KAED in the application of good business practices.

**Cereal Threshing Enterprise.** The cereal threshing enterprise had only been operating for one year, and financial records were not available. The nearly \$10,000 cost of the thresher implies that they still have a long way to go to amortize the investment cost of the equipment.

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<sup>20</sup> This section borrows heavily from Eriksen and Miller (1998), KAED Program Impact Evaluation.

**Grain and Groundnut Marketing Enterprises.** The results of cereal marketing enterprises have been mixed; several loans have had significant gross margins (one exceeding \$2,000<sup>21</sup>) and others have produced slim margins or even a loss. Two of the seven delinquent loans are for cereal-marketing enterprises. Achieving large net benefits on a single year's activity depends on judging correctly both the seasonal low and seasonal high prices. Several enterprises that waited until too close to the harvest season saw prices decline and had to hold their grain for another year, incurring additional costs and probably some physical loss of product. Although a financial risk exists in cereal marketing, especially if groups seek maximum profits as opposed to reasonably and relatively safe returns, animal-fattening enterprises face similar market risks and members may have less knowledge of the prices. The substantial grain reserves held contribute to a reduction in local food security risks.

**Animal-Fattening Enterprises.** Animal-fattening enterprises have had mixed results in the KAED program. Several loans have generated gross margins approaching \$2,000, and a number of others have generated negligible margins or lost money. Five of the seven delinquent loans are for animal-fattening enterprises. Several of the enterprises had animals die; one enterprise lost four animals. A number of the enterprises have tried to use market intermediaries to buy and sell animals with mixed results. A number of enterprises found that the purchase price of animals was higher than expected and the sale price was lower than expected or hoped. Animal prices are also seasonal; this was not always considered in the timing of the loans. Sale prices peak during various holiday seasons or near the beginning of the rainy season when good quality animals are scarce. Purchase prices bottom at the point when other producers realize that they may have trouble finding pasture and water or otherwise feeding their animals through the dry season. Experience in livestock purchasing and marketing is extremely important to the success of the operation, as is experience in feeding and caring for the animals' health needs.

Participants in successful enterprises say that the peanut hay and concentrate feeding regime recommended by KAED and extension programs is too costly to generate profitable results. They suggest that producers must use lower cost and lower value products such as peanut shells and millet stalks to form a large part of the ration.

The animal-fattening enterprises were established as group enterprises. Individuals successfully fattening livestock in the same villages claim that they have much better results, because it is clear who is responsible for feeding and care, and the animals are kept in their concessions where they can be watched closely. A system of individual responsibility also avoids any need for expensive stables and infrastructure, which KAED originally believed necessary for these group enterprises.

**Market Gardening.** Only two of eight enterprises doing market gardening have taken out loans (which were repaid). One began as a tree nursery but moved into market gardening when its owners realized that no dependable market existed for the trees. Few data are available on financial results of these enterprises. Villagers indicate that the new source of fresh vegetables is greatly appreciated and is improving local diets.

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<sup>21</sup> If the group has sixty members, as many do, this amount is less than \$35 per member.

**Revolving Credit.** Group activities, whether the demonstration fields or the actual enterprises, have allowed villages to develop small, internal revolving credit programs that lend small amounts of money to individuals. By 1997 twenty-six villages had established such funds, whose capital totaled more than \$11,000 (6 million FCFA). In many instances, villagers say that the activities financed by these funds are the ones that are both the most profitable and most important to improving family incomes. No information is available on repayment, but it is generally accepted that these loans are both small and repaid. Interest rates range from annual rates of 20 to 120 percent, and loans to nonmembers of the group are reported to be at interest rates as high as 200 percent.

**Other Impacts.** The KAED program has resulted in the application of good governance and management in a communal business activity. Members have received basic functional literacy and financial management training. Experience indicates that they have learned and apply the basics of transparent and effective financial management. They develop and implement business plans, submit these plans to financial institutions and receive loans, keep good business records, and repay their loans. These skills are applied not only to the communal enterprise, but also to their individual enterprises, which are typically more important to family income than are the group enterprises.

The communal enterprise is also an exercise in group governance. The enterprises have formal rules, which appear to be well known. Members cite rules for member behavior in meetings, procedures for making decisions, fines for misconduct, and conditions for ejecting a member. Reports indicate that the rules are generally followed, members receive and pay fines, and some nonconforming members are ejected. The combination of transparent accounting and financial management with transparent and orderly decisionmaking provides the basis for good governance in a basic community institution.

The enterprises and KAED program have contributed directly to improved nutrition (particularly the vegetable enterprises), food security (especially the cereal marketing enterprises and demonstration fields), employment (particularly the cereal mills, thresher, and livestock operations), and health (improved stoves, wells, local soap production, health huts, and medicine depots). Only a little less directly, any increase in family income contributes to all of the above.

Women make up 69 percent of the officers of enterprises developed in the KAED program, and thirty-three women are teaching functional literacy classes (48 percent of the total). Women have proved competent as officers and financial managers of group enterprises. Women's groups in particular have earned an enviable reputation with the formal financial institutions and are frequently a community's only access to formal credit. Some villages now indicate that the women's credit requests contain seasonal credit for the purchase of basic agricultural inputs such as seeds and fertilizer, in addition to their own enterprise activities. Women are also helping family economies by fabricating soap for home use or sale and using improved cook stoves. In a number of cases, women have requested and received a formal allocation of land from the rural council for their communal fields and individual fields. This demonstration of economic clout and personal capacity is beginning to change perceptions and attitudes toward women at the local level.

A study of spread effects was undertaken by Africare in December 1997. Of the fourteen satellite villages surveyed, eight had organized literacy classes, five had begun revolving credit schemes, six had created demonstration fields, and four had established tree nurseries (which contributed to initiating windbreaks in both private and demonstration fields) and village woodlots. Women in satellite villages surveyed had also constructed improved stoves and begun producing their own soap.

Several documents talk about the enterprises, providing sources of revenue that contribute to the reduction of seasonal and long-term migration from the village. No data, however, appear to exist on this phenomenon. It seems unlikely that the employment generated (slightly more than one paid employee per enterprise) or the revenue streams generated at the household level are yet sufficient to permit many family youth to remain in the village. They may have an effect in demonstrating to men and youth that it is possible to earn money in the village, rather than being forced to migrate to support the family.

The KAED experience demonstrates that the institution developed to run the enterprise (GIE, group, or co-op) develops sufficient cohesion to change to a different enterprise activity and continue to use and pay back credit to financial institutions, if they encounter insurmountable problems with the original enterprise activity. The determination to repay credit and maintain access to credit in the future appears to be a positive step, given the poor history of credit repayment in Senegal. These enterprises are only beginning to adapt to the possibility that the group can serve as guarantor to provide credit (in relatively small amounts commensurate with their ability to absorb the loans effectively and repay them) for activities managed by individuals or families rather than the group as a whole. Overall, it seems to indicate several positive steps toward the development of a credit system that can operate effectively in Senegal.

The KAED experience also demonstrates that local enterprises can profitably provide basic rural services, if they have access to capital and training in functional literacy and financial management. The government has disengaged from providing such basic rural services and the commercial private sector has failed to fill the void. Much of Senegal's rural population does not have access to these services, which are an important part of the enabling conditions for a productive and profitable agricultural sector and improving rural incomes. Demonstrating that small rural groups, GIEs, and co-ops can fill this void, much as they did in many developed countries starting 50 to 100 years ago, may be the most important and largely unplanned impact of the KAED program.

#### **4.6.3 NRM Impacts**

Specific NRM impacts are difficult to identify at this point in time. KAED objectives indicate that Africare recognized from the beginning that it would likely take a minimum of 5, but more likely 10 to 15 years to have much impact on the adoption of improved agricultural and NRM techniques. The rather complex package of NRM techniques featured in the demonstration field (windbreak, live fencing, field trees, rock dikes, grass strips, use of compost, and so on), has not been adopted as a package. (This should not be surprising, because farmers rarely adopt complex packages of techniques all at one time.) To date, however, relatively little adoption has occurred even of individual techniques, with the possible exception of composting and improved wood stoves.

KAED for the most part did not insist that compost pits be cemented and, perhaps for that reason, seems to have a higher rate of adoption than other program sites visited. (KAED did seem to have the advantage that a number of their sites were in areas with heavier clay soils.) Even then, digging the pits is considered the biggest constraint to the use of composting, and many villagers were making compost in piles instead. The second constraint to making compost cited by villagers was the availability of water and the time and effort needed to carry it. KAED did not adopt the production of compost during the rainy season. Access to a horse or donkey cart to transport the compost and the biomass to produce it was also indicated as an important constraint.

One does observe the adoption of trees planted to demarcate field borders in a way that resembles a windbreak or live fence, but this is rarely implemented in a manner that really provides the benefits of either. To date, no obvious attempt has been made to improve on the original effort. The most understandable explanation is that people see trees along field borders as having several advantages:

- Depending on the species, they will provide some fruit, nuts, pods, and so on and eventually poles and fuelwood.
- The fields are clearly demarcated, which will help avoid potential conflicts, particularly after the death of the head of the family. It is especially helpful to young men who might return home to inherit or defend the family's claim after years outside the village.
- The trees help reinforce one's claim to the field under traditional land tenure rules, which, although not the official law, are the rules most often applied in the village setting.
- Tree planting is also one form of land improvement (*mise en valeur*) recognized by the national (official) land tenure law.

One notable exception is the proliferation of live fences around family (men's) fields in Segré Gatta. Each year the women's group is collectively working to establish live fencing in the family fields of a few of its members.

Informants in the KAED villages appeared to be interested in expanding the use of leguminous field trees, particularly *Acacia albida*; obvious attempts had been made to plant such trees both in demonstration fields and a number of individual fields. The survival rate of these plantings, however, had been poor; typically only an occasional tree remained in rows that informants said crossed the entire field. (Given the notoriously poor success rate of *Acacia albida* plantings, the program might have had more success if they had trucked in some *Acacia albida* pods and fed them to the livestock.) KAED did not seem to strongly promote natural regeneration, perhaps because of the desire to push *Acacia albida* in areas where it frequently was not a native species.

One of the important NRM impacts was the construction of more than 1,000 improved cook stoves in KAED and neighboring villages. Many villages visited indicated that they had learned the technique from women in another KAED village. The KAED training effort not only has the impact of decreasing fuelwood consumption for these 1,000 stoves, but also the potential for the technique to be self-perpetuating.

The functional literacy courses did provide an important secondary result, which has direct implications for NRM. During the courses, some of the materials used and discussed included the Forest Code. Women in the KAED villages were aware that individuals who planted trees had the right to cut those trees as long as the intention was indicated at the time of planting. The impact is evident in the fact that many small woodlots have been established by women, who either already have or are in the process of obtaining a formal certificate on their right to use the land from the rural council. Africare required formal land title for any women's group establishing a demonstration field, which seems to have change attitudes about women gaining such "ownership."<sup>22</sup> This example along with the knowledge about the right to cut and benefit from trees planted seems to have combined to create a small movement toward women establishing woodlots.

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<sup>22</sup> Ownership in the traditional sense of usufruct, having a permanent right to use the land, but not to sell it.

## **4.7 Natural Resource-Based Agricultural Research (NRBAR)**

Given that the Eriksen and others (1998) evaluation of USAID assistance to ISRA in October 1998 covers the NRBAR program, this impact evaluation team was instructed to limit the time and attention spent on NRBAR. Some edited highlights of this evaluation regarding NRBAR follow:

The Natural Resource-Based Agricultural Research (NRBAR) project was developed in 1991 and continued through 1998. Project activities began in 1992 and were implemented within the framework of the long-term, multiproject effort of support to develop ISRA as an effective agricultural research institution. A technical assistance contract was awarded to the Consortium for International Development (CID), for which Oregon State University served as the lead institution.

The NRBAR project was designed to (a) promote ISRA's involvement in research related to the linkages between natural resource management and agricultural production, (b) promote linkages between ISRA research and NGO field-testing and extension activities, and (c) promote the availability of low-cost, natural resource-based agricultural technologies to increase the productivity and sustainability of agricultural systems. The stated project goal was to increase the productivity of cereal-based cropping systems in areas of Senegal with reliable rainfall (more than 400 millimeters annually).

### **4.7.1 NRBAR Project Outputs (as of July 1998)**

NRBAR outputs include the following:

- Twenty-four collaborative grants to ISRA researchers in partnership with NGOs, PVOs, and universities
- Twenty-seven grants to twenty-one ISRA researchers
- Thirty-five grants to researchers under ISRA's Natural Resource Management Program begun in 1997
- Seventy-four training visits conducted at project-funded research and development sites, attended by a total of 54 researchers, 443 "farmer leaders," and 8,813 producers
- Preliminary drafts produced of grant-funded project results
- Thirteen projects identified as having results suitable for publication as scientific articles, seven of which have been started.
- Two draft impact studies produced
- Consultant support in terms of studies and reports given to ISRA on economic research and impact evaluation, research station management, financial management, design and analysis of on-farm research, monitoring and evaluation, and elaboration of ISRA's mission statement and strategic plan.

The increased capacity to conduct high quality research resulting from the long- and short-term participant training received by ISRA researchers between 1981 and 1998 represents the most important and enduring



impact of the three projects supporting ISRA during this period. Many of these men and women will be leaders in their field in Senegal and internationally; some have already risen to positions of great responsibility. Unfortunately, ISRA itself will not have received many of these benefits.

With NRBAR support, ISRA recruited female candidates for master's-level training and three such candidates were selected and trained. Because almost half of the male researchers receiving graduate degrees in the past 17 years have left ISRA, it remains to be seen if they are any more successful at retaining female graduate-degree holders, who will be in even greater demand outside of ISRA.

NRBAR funding was also used to recruit and train ten women (among 600 candidates) in four-year bachelor of science-level programs at a Senegalese training institution. It is unclear how they will support the ISRA institution-building process, because they have not been offered any guarantee of employment at the institute.

NRBAR provided significant and timely support to ISRA at both central and regional levels with regard to managing research centers and stations. The NRBAR consultant provided clear recommendations on many different areas of improved station management, financing, and the use of human resources. These recommendations provided management options for consideration in ISRA's strategic plan (1998–2003).

By design, the NRBAR project never became effectively integrated into ISRA. As a result, the project ended up operating as an independent grant management unit outside ISRA's management control. The NRBAR project grants were signed by CID's chief of party, after consultation with a grant committee but without direct ISRA program management oversight or control. The project did use established ISRA financial procedures and rules in negotiating the grants and did not impose any new rules of its own. This has had the impact of helping ISRA personnel become more experienced in using these procedures in grants management. The NRBAR project did briefly attempt to pass their vouchers for grants through normal ISRA financial reporting channels. The substantial delays and loss of some vouchers led NRBAR to abandon the effort and submit the vouchers directly to the project's own grant management officer.

The eventual impact of a grant management scheme is uncertain, particularly if grants are made in small amounts, are made to one or two researchers each, and depend on NGOs with limited expertise in agricultural extension and limited zones of intervention for diffusion of new technologies. The assessment team noted a consensus among ISRA researchers that the NRBAR project grants process actually weakened research team cohesiveness by awarding money to "one or two people" at an ISRA research center or station, rather than to the entire team that has together developed that center's or station's work plan. Heads of regional research groups and others within ISRA, expressed the belief that grant proposals should be made to the regional research teams as a whole with funds to be managed by the team leader within ISRA's existing and more decentralized financial and administrative structure.

The NRBAR project's grant process, especially in the collaborative grants program, leans heavily toward technology transfer. This in itself is not a bad thing. The requirement for collaboration with NGOs has sometimes resulted in ISRA researchers and technicians doing much of the "extension" side of the projects themselves, but with only a fraction of the project's grant proceeds.

Even considered as adaptive research and extension, the types of data collected and the analyses done seem inappropriately superficial as preoccupations for a national research institute. At least the projects observed by the team appear to have little chance for appreciable impact compared to the amounts of money spent. Working under a grant model with so many small NGOs, farmers groups, and others—each with a small number of field agents and a small zone of intervention—is necessarily and inherently inefficient. Can such a model really be appropriate for a national research institute with ISRA's broad mandate?

One of the NRBAR project's primary objectives was to resolve the "financial crisis that lies at the heart of ISRA's institutional problems." This crisis has not been resolved. Effects of this crisis include the following:

- The funding intended to finance ISRA's NRM program directly was never made available for that purpose. In 1997 this funding was used to fund a second competitive grant program for research teams. NRBAR has not provided ISRA with any significant operating costs.
- A delay in funding and activities compromised the continuity of production system research and extension efforts initiated under previous USAID funding and, thus, the generation of useful research with new NGO partners.
- The previous achievements of integrating USAID resources into ISRA's own development has been compromised.
- A substantial portion of the NRBAR funding was unspent and subject to de-obligation at a time when ISRA would desperately need outside support.

Given the scarcity of funds, research centers often used NRBAR project revolving funds to meet other short-term payment needs. Grant recipients often could not access the funds advanced when they needed them to meet their seasonal needs in implementing their field research programs.

A survey of participant trainees who left ISRA, indicate they left because there was no funding for the programs on which they were trained to work and because the salaries were too low to live on. Basic ISRA salaries of \$330 per month, are less than a fourth of what the same researchers can receive working for an NGO within Senegal. The social benefits outside ISRA are also likely to be better.

The most disappointing thing about the NRBAR grant-funded projects is that they totally miss the opportunity to do needed adaptive research on the technologies under study. They serve an extension function, in that technologies are demonstrated to farmers. But it is assumed that merely by measuring yield differences between farmers' practices and "improved" technologies in these on-farm demonstrations, the technologies are somehow "validated." Of most concern is the apparent assumption that these technologies are ready "off the shelf" to be extended directly to any farmers wanting them (without testing and adaptation).

Identification of recommendation domains for these technologies, a valid subject for research, is ignored. To take the case of composting, the results appear to be that this is a good, "validated" technology, but that some problems still exist, for example, lack of manure and lack of water. One goal of on-farm adaptive research on this theme should logically be to define recommendation domains in part by identifying those

on-farm environments in which the technology is adapted, both biophysically (i.e., where a response exists to well-made compost) and economically (i.e., where the necessary resources—water, manure, transport—are or can be made available). The likelihood of impact from this sort of research is much greater than for research intended to validate technologies generally, without regard to environmental adaptation.

## **4.8 Winrock: On-Farm Productivity Enhancement Program**

The impact assessment team visited two Winrock villages and had access to the socioeconomic evaluation of Winrock activities by Aifa Fatimata Ndoeye, which used 1995 data as the basis for her report. The team was unable to find any basic documentation about the program at USAID/Senegal. Much of what the team saw in the villages visited seemed to be focused on the small NRBAR buy-in to Winrock's On-Farm Productivity Enhancement Program (OFPEP) to do particular compost research trials, rather than having the broader focus described in OFPEP documentation.

In 1987 Winrock began the OFPEP with funding from USAID in five countries in Africa, including Senegal. In Senegal, the project focused on introducing (a) a limited number of technologies, primarily improved seeds of different types in different places, (b) the use of composting or other methods to improve soil fertility, and (c) the introduction of live fencing to protect small fields of cassava. Farmers were encouraged to develop a stand of field trees in the enclosed fields through natural regeneration. Some tree planting was also promoted.

Background information indicates that live fencing was introduced with the idea that once the technology was known and planting material was available, it could be used for erosion control purposes. Taking this step from protecting a high value crop like cassava to providing erosion control, however, was not evident in the villages visited.

Initially, Winrock used improved seeds as an incentive to entice farmers to build and use cemented compost pits (required for a farmer to receive improved seeds). This requirement was later dropped as too restrictive, and, over time, Winrock moved away from requiring that compost be prepared in cemented pits. It became obvious that the cemented pits were not acceptable to most farmers, but many farmers were experimenting with surface compost piles on their own.

Winrock had several unique features in its mode of operation:

- Winrock associated its activities with those already established by an existing NGO or organization and focused on the transfer of agricultural and NRM technologies.
- % The villages visited by the assessment team were not Winrock project villages per se, but rather villages where the Christian Children's Fund had established

community development and drought relief activities, but lacked expertise in agriculture and natural resource management.

- Winrock typically introduced improved seed as tests on a small field (as opposed to 10-meter by 10-meter research plots). These were typically about a fourth to a half hectare for millet fields. Most of the seeds used were shorter cycle than traditional seeds and somewhat more disease resistant. The improved seeds (rice and millet, in particular) often produced double the yield of the farmers' traditional variety. Winrock did use the 10-meter by 10-meter research plots for the compost trials, using NRBAR protocols, and the compost was spread on 0.09 hectares, rather than the quarter hectare for which it was intended. Winrock has used farming system techniques (recommendation domains, modified stability analysis, confidence intervals, partial budgeting, dominance analysis, and socioeconomic impacts) to evaluate some of their activities, but the evaluations available in printed form seem to be limited to a few case studies, rather than part of the general process.
- Winrock established a cost-effective system of having local farmers multiplying improved seed for local use. Winrock Project Director Faye suggested that the entire program be funded through a revolving fund of about \$800 to purchase new seed. Farmers doing the multiplication were allowed to keep or sell a portion of the seed. Farmers in the program who received the multiplied seeds returned between 3 and 10 kilograms of seed to the program per kilogram of seed received. This allowed an increase in the number of farmers who had access to the improved seed at low cost.
- Winrock used voluntary local facilitators selected by the community (in most cases) rather than a professional, paid extension agent. Winrock trained these facilitators and interacted with them directly through project staff. The local facilitators seemed to be well integrated into the community and quite effective as agents of change. The system has the great advantage that the facilitators remain there when the project ends. This seemed to be a model that should be seriously considered for future USAID program activities.
- Winrock had an improved rice seed program, which used Peace Corps volunteers (perhaps, among others) as the village organizers and intermediaries for distributing seed. From some limited accounts, this program worked directly with five to ten lead farmers in 140 villages over a four-year period. Yield increases were typically at least 20 percent. Several sources indicate that many of these lead farmers in turn provided seed for up to three additional women within the village or as many as five women in other villages.

- Winrock has another "seed for trees" program developed with the Peace Corps agroforestry program. The program provides improved seeds to plant a specific surface area on which the farmer agrees to refrain from cutting all of the trees when she or he clears the field for cultivation. The Peace Corps experience in Thienaba seems to imply that this partial protection is sufficient to produce a large increase in the number of field trees. The Thienaba experiment is now being expanded to five additional areas.

The impact assessment team is impressed with Winrock's innovative and cost-effective improved seed programs. These seem to be the types of programs that can have an important impact on agricultural production and productivity and improving rural incomes. The "seeds for trees" approach seems to be a much more appropriate and effective incentive system than those approaches used by SRP, CBNRM, and KAED to promote activities that have a large and immediate biophysical (NRM) impact. The availability of the original "certified" or high-quality improved seeds appears to pose a problem for the use of such a program on a large scale. Assuming that ways can be found to overcome this constraint (such as SO1 promotion of seed production enterprises), this seems to be the type of activity that should be integrated into new USAID programs.

The impact assessment team was impressed with the linking of live fencing to a high-value cash crop activity. This seems to be the most appropriate manner to initiate live fencing, which is a labor-intensive and fairly expensive technology to get started. It would be interesting, with time, if these enclosures were reinforced with thorny species that produce edible and/or marketable products. The conceptual linkage to use of live fencing for erosion control is interesting, particularly where rocks are not available to build rock dikes, but the team saw no instance in which this step had been taken. It is unclear whether villagers will make the conceptual leap from using live fencing in enclosures to using live fencing on contour lines as a means of erosion control.

The assessment team was somewhat disappointed with the NRBAR-Winrock compost activity. The cement pits were tested, but apparently failed to be accepted by farmers. Farmers appreciated the results received with use of the compost, but did not accept the investment required to build cement pits. A number of farmers were adapting the technique by attempting to make compost piles on the surface. Winrock appeared to show little follow through in promoting this adaptation and a move toward a technique that is acceptable to farmers. Rather it seemed that, once the NRBAR program ended, Winrock was also neglecting the compost program that it had begun. The two-year NRBAR activity did not provide the time necessary to move through a normal testing, adaption, and diffusion process.

## **4.9 The Rodale Institute**

The impact assessment team visited two Rodale Institute villages and had access to two socioeconomic evaluations of Winrock activities by Aifa Fatimata Ndoeye and Animata Faye. Ndoeye analyzes results from 1993–95 in Ndamsil (although the compost and fertility study with ISRA began in 1989 there). Faye uses

data from 1997 in Ndoff. The team was unable to find any basic documentation about the program at USAID/Senegal.

The Rodale Institute has received a number of grants for work in Senegal dating back to the late 1980s. In 1987 Rodale used this funding to establish an applied development model, called the Regenerative Agriculture Resource Center (RARC), in Senegal. It was established to carry out applied research, education, and communication activities focusing on women farmers. The objectives of Rodale's applied development model are to:

- Increase the practical application of information about regenerative agricultural methods
- Increase marketing opportunities for home garden crops grown without synthetic pesticides and fertilizers
- Enhance RARC sustainability through private sector investments in enterprises related to marketing organically grown garden crops.

The objectives of RARC are:

- Increase food sufficiency for rural and urban communities and decrease dependence on purchased inputs for food production.
- Strengthen collaborations with men and women farmers' organizations in communities where the RARC project is implemented and offer a focused opportunity to develop home gardens into sources of diverse nutritional and income resources.

The Rodale Institute received a matching grant for 1992–95 from PVO/BHR/PVC to continue these activities. A new matching grant was again received in 1995 to extend this experience. The Senegal RARC became a Senegalese NGO in 1997 and is working toward becoming legally and financially autonomous.

The 1995–96 program principally targets twenty communities in the St. Louis region and four around Koumpentoum. The team did not visit St. Louis or Koumpentoum and saw no documents evaluating those experiences. The continuity of activities in Thies and Fatick is not clear. These activities were apparently financed principally under the earlier grants and through the NRBAR buy-in. Much of what the team saw in the villages visited seemed to focus on the small NRBAR buy-in to the Rodale program, which, in particular, has been doing compost research trials. Although the team visits took place at the beginning of the gardening season, gardening activities had not yet started in N'Dioufane. In Ndoff, the women were just beginning their nursery beds, although other gardens in the village had already planted their production beds. Neither gardening activity appeared very dynamic.

In Ndoff, the Rodale activities apparently began in 1995 and largely ended in 1997. The Rodale program focused principally on ten compost and soil fertility tests, which incorporated the use of improved seeds (millet, sorghum, and cowpeas); support for an existing women's garden; introduction of a press to extract oil from neem seeds, which serves as a pesticide for grain storage; and testing of thorny species for use in

live fencing. The Ndiamsil site also benefited from an animal-fattening program to help produce manure for the compost activities, according to Ndoye, but that was not evident in Ndoff.

Participants in Ndoff, stated that they appreciated the Rodale intervention for addressing the critical problem of soil fertility. The group PRA activities, however, found that Ndoff had tried and failed to get the Rodale Institute to support work on an 8-hectare improved pasture plot that was begun under Projet de Reboisement et de Conservation du Bassin Arachidier. Others claimed that the most important AG/NRM problem was the loss of their women's rice fields because of salinity problems.

Again, the assessment team was disappointed with the NRBAR/Rodale compost activity. As in the Winrock experience, farmers found the cemented pits unacceptable and were experimenting with compost piles on the surface, but no continuing support existed for this adaptation process. The formal NRBAR analyses seem to conclude that the cement pit technique should be diffused, but talking with farmers certainly gives one exactly the opposite impression. Rather, support is needed for promoting and testing the production of quality compost in piles (or in pits without cement in clay soils), for which composting (but not filling) takes place during the rainy season (to avoid the need to carry water for the compost). Such a continued testing process might have resulted in a "best bet" technology for future diffusion on a broad scale, but the process was aborted when the two-year NRBAR activity ended. Cement pits do not appear to be acceptable to farmers, and, therefore, this is not a technology ready for diffusion under present conditions.

#### **4.10 Southern Zone Water Management (SZWM) Project**

The impact assessment team was unable to visit the Southern Zone for security reasons. USAID/Senegal was unable to find a copy of the final report. The following are some observations based on the existing program evaluations and reports.

The Southern Zone Water Management (SZWM) project was authorized in August 1988 and continued through February 1998 with a budget of \$18 million. The overall purpose of the project was to reclaim lands damaged from the intrusion of saltwater in sixty valleys by building anti-salt dikes and to improve water management by constructing water retention dikes higher up in these valleys. This was intended to contribute to the goal of increasing agricultural and, particularly, rice production.

## Key Outputs (1990-95)<sup>23</sup>

Valleys developed ( <i>number</i> )	22
Beneficiary population ( <i>number</i> )	76,876
Beneficiary villages ( <i>number</i> )	183
Village water management committees ( <i>number</i> )	176
Dikes constructed ( <i>number</i> )	54
Length of dike constructed ( <i>kilometers</i> )	26
Area of valleys developed ( <i>hectares</i> )	10,198
Areas directly influence by dikes ( <i>hectares</i> )	6,334
Water deficit areas improved for soil conservation ( <i>hectares</i> )	4,008
Demonstration plots (through 1994) ( <i>number</i> )	68
Compost pits usable in 1995 ( <i>number</i> )	560
Cultivated area in 1994 ( <i>hectares</i> )	4,864
Rice production in 1994 ( <i>tons</i> )	5,313
U.S. master's degree training (1996) ( <i>persons</i> )	3
Intervalley visits conducted ( <i>number</i> )	40
Intervalley visit participants ( <i>number</i> )	1,244
Women's training sessions ( <i>number</i> )	33
Participants in women's training ( <i>number</i> )	2,426
Short-term U.S. or third-country training ( <i>persons</i> )	10
Village training sessions ( <i>number</i> )	59
Women participants in village training ( <i>number</i> )	3,078
Village participation in construction/demonstration ( <i>person/days</i> )	19,979

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<sup>23</sup> Louis Berger International (1996), SZWM Project Final Report. Washington, D.C.



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A few essential points concerning the SZWM program are summarized below:<sup>24</sup>

- The project design overestimated the number of valleys and the number of hectares that would be developed or improved as well as the yield increases that would be achieved. It grossly underestimated the cost of dike construction.
- % Delays and increased costs resulted in the program developing anti-salt dams in twenty-two of the sixty valleys originally targeted. This also reduced the area that could be directly or indirectly influenced by the dikes from an original target of 15,000 hectares to about 10,000 hectares. No figures exist, however, from the latter years of the project to indicate how many hectares were actually placed in cultivation or how long it took to reduce the salt sufficiently so that farmers could cultivate the land.
- Construction costs were helped by the devaluation in 1994, but were still about 240 percent higher per valley than estimated. The contractor found that it would take several

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<sup>24</sup> These comments borrow heavily from Mongelard and other (1994) and Gadbois and others (1996).

years to complete each dike if manual compaction was necessary. The contractor switched to mechanical compaction to get the job done and had to make dikes wider (3 meters instead of 1 meter) to use heavy mechanical equipment. All of these changes resulted in large cost increases, especially because the design budget was based on the expectation that compaction would be done by villagers who would provide the manual labor at no cost to the project.

- The project design assumed that yields on recovered land would average 1.8 ton per hectare in years of normal rainfall. But that figure assumed that the water management activities of the project would be complemented by the provision of basic agricultural services by the Société pour la Mise en Valeur Agricole de la Casamance (SOMIVAC). The government's closing of SOMIVAC under the pressures of structural adjustment rendered that assumption false. Without access to basic agricultural services such as credit, agricultural inputs (improved seed, fertilizer, and equipment), agricultural marketing, transportation, and extension services, farmers had no way to attain the yields that had been used to justify the financial and economic viability of the program.
- % The closing of SOMIVAC with no alternative provision for providing the basic agricultural services that are among the enabling conditions for a profitable and productive agriculture left the SZWM program with little chance of meeting its goal-level objective.
- % The mid-term evaluation suggests that the closing of SOMIVAC was unexpected. Yet, the policy of government disengagement from providing such services and downsizing or outright dissolution of parastatals had been under way progressively since the structural adjustment program began and caused the government to announce the New Agricultural Policy in 1980–81.
- % The SZWM program belatedly tried to organize some basic agricultural services through collaboration with NGOs, but it was "too little, too late" to achieve the productivity levels that were expected.
- With fewer hectares developed than planned and lower yields than projected, the program fell far short of the expected increases in production.
- Project implementation was severely delayed by changes in the lead ministry and by serious security problems in the Ziguinchor region, as well as by problems fielding the contractor team and important changes in that team, once fielded.
- The village and inter-village water management committees have not been entirely successful in regulating conflicts in participatory water management.

- The water management actions that would benefit farmers with fields above the dike often directly contradict the actions that would benefit farmers with fields below the dike.

#### 4.11 PVO/NGO Support Project<sup>25</sup>

The impact assessment team did not specifically visit any PVO/NGO Support Project sites, nor did it find any evaluation documents on the program. The information below is primarily based on program documents. To really understand the impact of the PVO/NGO Support Project, one needs to understand seventy-two PVO and NGO programs financed under the project, and the institutional development of the sixty or more organizations that implement them. That is beyond the scope and capacity of this assessment.

The PVO/NGO Support Project was designed in 1990 with a budget of \$15 million. This amount was later raised to \$21 million following the expression of increasing financial needs by the NGO community. The project purpose was to "enable local NGOs, NGO associations, and community groups with U.S. PVO assistance to plan, design, and carry out sustainable development activities." The goal was to "improve the standard of living for poor Senegalese as measured by increases in access to inputs, goods, and markets and improved access to primary health care, literacy training, and credit and savings.

In 1994 the project was redesigned to address the issue of slow progress in the grant selection process and to realign the project with USAID/Senegal's 1992–97 Country Strategic Plan. The program objectives were redefined as:

- Supporting viable and sustainable development activities, initiated by village groups and associations and focusing on the project's key intervention areas, creating a valid and positive impact on the lives of the populations.
- Strengthening the technical and managerial capacity of groups and associations to elaborate, plan, and implement viable and sustainable projects with NGO support.
- Strengthening the technical, organizational, and institutional capacities of NGOs, NGO associations, and development organizations to allow them to provide support for the sustainable development initiatives of community groups at the local level.

The project had two major interdependent elements: (a) institutional support to local NGOs and NGO associations and (b) subgrants to U.S. PVOs, local NGOs, or U.S. PVOs and local NGOs working collaboratively for sustainable, community-based activities.

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The following summary of outputs and impacts is taken from Awa Paye Guèye (1998).

The project provides institutional support to strengthen the capacity of NGOs and PVOs at all phases of the project cycle. It does this primarily by providing training and technical assistance in project design, implementation, monitoring and evaluation, and planning and management. The amount of institutional support offered is based on a needs assessment. The project also encourages and supports collaborative relationships between U.S. PVOs and local NGOs or community associations.

The subgrants component finances a wide range of community-level activities in development areas including agriculture, natural resource management, micro- and small-scale enterprise development, primary health care, family planning, and functional literacy designed and implemented by the local communities. The activities use a participatory approach that enhances the capacity of the local communities to take charge of their own development, as well as to provide direct benefits.

The program is implemented by a coordinating entity, called the Umbrella Support Unit (USU), which has been established and managed by the New Transcentury Foundation, a U.S.-based PVO. USU provides the full range of training, technical assistance, grant processing, monitoring and evaluation, financial management, and organizational support implemented under the project. A National Project Committee serves as the steering committee and approves the larger grants.

#### **4.11.1 Outputs and Impacts**

From the documentation available it appears that the PVO/NGO Support Project has provided funding to more than thirty NGO and PVO programs and a slightly smaller number of NGOs and PVOs, because a few of the organizations have benefited from funding for two or three programs. In the process, the project has certainly contributed to strengthening of the NGO sector in Senegal. Many of the programs contain several of the fourteen components summarized below, so it is difficult to determine the total number of villages and clients that have benefited or the time period during which the activities were implemented. A number of the areas of intervention are also outside the area targeted by the AG/NRM strategic objective.

Both outputs and impacts vary greatly among the different types of activities supported and are summarized below. The various agricultural activities have contributed to increased production and a reduced food deficit and helped diversify agricultural activities and provide some income.

- The project stopped funding market gardening because it did not produce the results expected, especially given the investment required (in infrastructure), and often required more time and labor than the women had to offer.
- The project stopped funding livestock-fattening activities because it often took beneficiaries longer to fatten the animals and repay the loans than programmed, reducing the number of people who could benefit from the use of the revolving funds.

The project found that agroforestry activities are restricted by low rainfall, hostility of the environment, straying of domestic animals, need for social mobilization, and long delays to achieve and perceive the target results.

The project found that programs have great success with credit for small-scale trading activities and women almost always manage to make a profit and repay the loan, even after several rotations. Credit programs for microenterprise activities result in significant employment, but are more risky, given that they are often affected by national and regional economic trends. The recipients for microenterprise activities are predominantly men.

- Women quickly develop their own systems of revolving credit for small-scale trading if they have access to the capital to do so.

### **Cereal Production**

Programs ( <i>number</i> )	6
Beneficiary villages ( <i>number</i> )	44
Area sown ( <i>hectares</i> )	1,015
Quantity of cereal produced ( <i>tons</i> )	3,193
Cost of inputs and equipment ( <i>FCFA</i> )	41,127,995
Income generated by cereal sales ( <i>FCFA</i> )	7,558,750

The cereal production programs focused on rice and sorghum production. Most of the cereal is used for consumption, reducing the food deficit of the zone and contributing to improved living conditions.

### **Sesame Production**

Programs ( <i>number</i> )	1
Producer groups ( <i>number</i> )	50
Self-managed markets ( <i>number</i> )	4
Amount of revolving fund ( <i>FCFA</i> )	8,400,000
Area sown ( <i>hectares</i> )	3,525
Quantity of sesame produced ( <i>tons</i> )	2,000
Quantity of oil processed and sold ( <i>liters</i> )	116,460
Income generated by sale of sesame ( <i>FCFA</i> )	40,379,500
Income generated by sale of oil ( <i>FCFA</i> )	60,120,000

The sesame production program has helped diversify agricultural production and income sources. Processing sesame to produce oil provides additional revenue through employment and value added. Sesame production has spread quickly throughout the Kolda region and appears to have potential for both domestic consumption and export.

### **Market Gardening**

Programs ( <i>number</i> )	13
Beneficiary villages ( <i>number</i> )	70
Beneficiaries ( <i>number</i> )	4,687
Area sown ( <i>hectares</i> )	321
Length of hedges ( <i>meters</i> )	35.3
Wells dug or repaired ( <i>number</i> )	70
Quantity of vegetables produced ( <i>kilograms</i> )	524
Amount of revolving fund ( <i>FCFA</i> )	56,681,367
Income generated by vegetable sales ( <i>FCFA</i> )	31,763,576

Although the income generated was quite substantial, on average the gardens only produced 7.5 kilograms of produce. Results relative to the investment have been relatively poor. Women often found that the gardening required more time than they had to give, along with their domestic chores. In later grants, the project did not encourage this activity.

### **Livestock Fattening**

Programs ( <i>number</i> )	9
Beneficiaries ( <i>number</i> )	479
Animals fed ( <i>number</i> )	1,140
Amount of funds distributed ( <i>FCFA</i> )	34,745,551
Interest generated for group treasuries ( <i>FCFA</i> )	1,944,326

Loans to people fattening livestock have generated substantial interest as a form of self-financing to increase the funds available to local groups. Programs found that clients often prolonged the planned fattening period, delaying repayment and limiting the number of clients who could benefit from the use of revolving funds. In later grants, the project declined to fund any animal fattening.

### **Fruit Tree Production**

Programs ( <i>number</i> )	7
Area planted ( <i>hectares</i> )	52
Seedling planted ( <i>number</i> )	14,795
Species ( <i>number</i> )	11
Amount of revolving fund established ( <i>FCFA</i> )	4,630,250

### **Agroforestry**

Programs ( <i>number</i> )	12
Beneficiary villages ( <i>number</i> )	110
Tree nurseries established ( <i>number</i> )	69
Area reforested ( <i>hectares</i> )	68
Trees planted ( <i>number</i> )	104,428

Species targeted ( <i>number</i> )	15
Length of hedges and windbreaks ( <i>meters</i> )	36,251
Compost pits ( <i>number</i> )	276
Quantity of compost produced ( <i>cubic meters</i> )	768
Kadd trees revitalized ( <i>number</i> )	6,095
Improved stoves constructed ( <i>number</i> )	916
Anti-erosion dikes built ( <i>number</i> )	65
Contour dikes built ( <i>number</i> )	1,531

The project found that agroforestry activities are restricted by low rainfall, the hostility of the environment, straying of domestic animals, the need for social mobilization, and the long delay to achieve and perceive the target results.

### **Transfer of Appropriate Technologies<sup>26</sup>**

Programs ( <i>number</i> )	1
Craftsmen trained to make improved cook stoves ( <i>number</i> )	33
Improved stoves sold ( <i>number</i> )	30,566
Craftsmen trained to make “Diambar” pumps ( <i>number</i> )	22
Pumps sold ( <i>number</i> )	1,467
Craftsmen trained to make filtering points ( <i>number</i> )	5
Filtering points sold ( <i>number</i> )	433
Onion producers ( <i>number</i> )	1,275
Quantity of onion bulbs produced ( <i>kilograms</i> )	6,000
Profit on onion ( <i>FCFA</i> )	8,966,000

Even if improved stoves save only 100 kilograms of fuelwood per family per year, 30,000 stoves should reduce fuelwood consumption by 3,000 metric tons and help save approximately 700 hectares from the ax each year. Pumps are distributed all around Senegal and even abroad.

### **Processing Cereal, Mills, and Threshers**

Programs ( <i>number</i> )	12
Mills installed ( <i>number</i> )	18
Threshers installed ( <i>number</i> )	5
Villages served by threshers ( <i>number</i> )	101
Quantity of cereal processed ( <i>kilograms</i> )	2,281,147
Income generated ( <i>FCFA</i> )	17,799,610

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<sup>26</sup> The Senegal Agricultural Sector Retrospective Study indicates that Appropriate Technology International artisans had already produced 27,000 improved stoves and 1,600 pedal pumps in 1995, when this financing started. It is not clear if these figures include those earlier outputs or are in addition to them.

The milling activities created employment for twenty-eight people, in addition to providing a service that lightens women's household duties and generating revenue for the groups involved in proportion to the population served. Women manage the enterprises successfully, strengthening the grassroots organizations involved and providing capital to launch other activities. Due to a bad harvest in 1997 in the peanut basin, however, equipment there was hardly used during that year.

### **Cereal Banks**

Programs ( <i>number</i> )	3
Cereal banks built ( <i>number</i> )	20
Quantity of cereal stored or sold ( <i>tons</i> )	333
Revolving fund established ( <i>FCFA</i> )	16,500,000
Revenue generated ( <i>FCFA</i> )	18,016,925

In addition to generating revenue, the cereal banks contribute to food security in their local areas. Clients understand and appreciate the regulation system for their operation. Price fluctuations, in effect, make decisions regarding the proper time to buy and sell grain both critical and difficult. These decisions sometimes create conflict among beneficiaries.

### **Credit/Small-Scale Trade**

Programs ( <i>number</i> )	13
Beneficiary groups ( <i>number</i> )	230
Beneficiary groups having savings accounts ( <i>number</i> )	85
Women beneficiaries ( <i>number</i> )	13,464
Initial amount of revolving fund ( <i>FCFA</i> )	185,084,778
Amount of funds distributed ( <i>FCFA</i> )	443,599,760
Amount of personal contributions ( <i>FCFA</i> )	38,320,500
Amount of interest generated ( <i>FCFA</i> )	40,824,296
Amount of savings accumulated ( <i>FCFA</i> )	59,033,444
Reimbursement rate ( <i>percent</i> )	93

The activity has distributed loans 2.4 times the amount placed in the revolving fund with a high reimbursement rate and an accumulation in savings. The activity is in heavy demand, because beneficiaries usually succeed in generating a profit. In several cases, the small-scale trading activity nearly dominated the other activities a program was trying to implement.

The system of revolving credit for small-scale trading has already taken root among the target population, including the use of personal contributions and interest. Credit cycles are regular, and repayment schedules are respected. Women are the primary recipients and almost always manage to pay back their loans even after numerous rotations. The trade activities target agricultural products, small ruminants, trinkets, and cosmetic products.



## Credit/Microenterprise

Programs ( <i>number</i> )	6
Village shops ( <i>number</i> )	15
Start-up fund for village shops ( <i>FCFA</i> )	36,012,150
Credit and savings organizations ( <i>number</i> )	56
Women members ( <i>number</i> )	7,862
Individual microenterprises funded ( <i>number</i> )	178
Jobs created or consolidated ( <i>number</i> )	728
Initial amount of funding ( <i>FCFA</i> )	467,935,597
Amount of funds distributed ( <i>FCFA</i> )	325,556,565
Amount of personal contributions ( <i>FCFA</i> )	24,371,537
Amount of interest generated ( <i>FCFA</i> )	40,824,296

The majority of recipients are men, and the amounts involved tend to be higher than in the small-scale trading credit schemes. These enterprises are affected by the economic crisis more often than the small-scale trading enterprises, which does affect repayment schedules and rates.

## Village Waterworks

Programs ( <i>number</i> )	9
Direct beneficiary villages ( <i>number</i> )	44
Population served ( <i>number</i> )	8,418
Water towers ( <i>number</i> )	7
Length of water networks ( <i>meters</i> )	16,398
Water fountains installed ( <i>number</i> )	6
Wells dug or repaired ( <i>number</i> )	32
Wells equipped ( <i>number</i> )	14

The populations involved have respected their commitment to pay a fee corresponding to the volume of water used. Populations benefiting from a network connected to a bore hole, were often reluctant to allow others to be added to the network. Older bore holes are subject to frequent mechanical problems due to age and limited maintenance. In some cases the intervillage management committees are not sufficiently well organized to address these problems effectively.

## Health

Programs ( <i>number</i> )	12
Units set up ( <i>number</i> )	45
Villages covered ( <i>number</i> )	85
Population targeted by health units ( <i>number</i> )	19,394
Latrines built ( <i>number</i> )	40

Needs assessment studies indicated that MCM and information, education, and communications were the priority needs in the zones of intervention. Programs train matrons, community health workers, and relay workers for four to five months before they begin to provide services under the supervision of health professionals. Some populations are reluctant to accept services from the newly trained staff. Information, education, and communications activities for family planning still experience difficulties getting established in most localities. Sexually transmitted diseases and AIDS-related services are of great interest to the populations.

### **Literacy Training** (*number*)

Programs	24
Literacy training centers	215
Trainers trained	13
Trained facilitators	199
Enrolled participants	6,986
Dropouts	1,344

Enthusiasm is high at the beginning of a program, and many people enroll, requiring a large number of classes. The cyclical movement of populations linked to seasonal activities, however, can greatly affect the number of beneficiaries who stay in the program for the duration of the class.

All of the funded NGOs and programs benefit from technical and management training. Most of the programs also dispensed large amounts of training among their activities.

## **5.0 Assessment of the Impact of Select SO2 Programs**

Two individual programs and a complex set of interrelated programs stand out in the impact assessment of the AG/NRM Strategic Objective. They stand out both for what they have and have not done, as well as for the potential these experiences have to inform future USAID/Senegal programming and particularly the new SO1 and SO2. The individual programs are the Kaolack Agricultural Enterprise Development Program and Winrock's On-Farm Productivity Enhancement Program; the complex set of programs is the SRP-CBNRM continuum, along with the other programs funded in the broader context of SRP and CBNRM.

### **5.1 Kaolack Agricultural Enterprise Development Program**

The Kaolack Agricultural Enterprise Development Program (KAED) was a traditional village-level program that had the great advantage that its activities focused on the use of credit, which produced important people-level impacts in a fairly short amount of time. It was traditional in its targeting of the village as its level of intervention and, perhaps, also in the tendency to give villagers substantial gifts in the form of infrastructure and equipment as a way to win their hearts and loyalty. KAED incorporated villagers in identifying problems and potential solutions through the use of a PRA and particularly in the choice of a primary enterprise within the narrow range of predetermined activities that Africare/KAED had decided to finance. The program established a field in which to demonstrate NRM and improved agricultural practices and trained GIE members in functional literacy and financial management. It is not yet evident that the demonstration fields have had a major impact on NRM and agricultural practices, but it did serve two important purposes, perhaps both unplanned. It served to demonstrate that women could gain access to land through group activities and obtain a formal certificate on their use rights from the rural council. It also served as a means for the GIE to accumulate capital. This capital was most often used to establish a revolving fund, from which members could receive a loan to fund small-scale trading activities and, thereby, improve personal income. The combination of training, demonstration field work, work to establish a primary enterprise, and revolving credit in many of the fifty-six cases resulted in a cohesive and functional GIE, in addition to establishing an enterprise.

It is important to distinguish between the GIE and enterprises, because (a) many GIEs have multiple enterprises and activities and (b) several GIEs have reoriented themselves when a primary enterprise proved unsuccessful and have begun a new primary enterprise, while still managing to reimburse their loan. A number of the GIEs have successfully reimbursed two, three, and four loans and established a relationship of trust with the financial institution so that it no longer requires a guarantee after the third loan to an individual GIE. GIEs are also beginning to expand their roles by using a portion of the loans they receive to expand the revolving fund for small-scale trading, purchasing agricultural inputs like seed, fertilizer, and so on.

The success attributed to KAED is not to say that it is without fault. Many of the enterprises developed by KAED would have great difficulty amortizing the capital costs of the infrastructure provided by the program. Many activities would have begun with less elaborate infrastructure if GIE members knew that they would have to help pay for it and were given a voice in what infrastructure was needed. One suspects that only a few determined groups would have chosen to do market gardening or animal fattening, if they were starting in a situation in which a well would be needed and it would not be a gift. The increased consideration necessary would probably lead to stronger and more successful enterprises, but perhaps would also require expanding the range of activities that the program would help support.

It is still difficult to judge the success of KAED's strategy regarding the demonstration fields and introducing NRM practices. KAED has had more success in introducing composting than most programs, probably because it did not insist that composting be done in cemented pits. KAED farmers typically use uncemented pits (in clay soils) or do the composting in piles on the surface, sometimes using a fence to help hold the material in place.

The NRM activity that is perhaps the most obvious result of the demonstration field is still not well understood by farmers. Many farmers have demarcated field boundaries, but in a manner that provides neither the benefits of a windbreak nor a live fence. It is still not clear whether this practice foreshadows a changing attitude about planting trees along field borders or was done primarily to demonstrate solidarity with program objectives and recommendations. Another small but important tendency is that of women establishing woodlots. Women learned from the demonstration field that it was possible to get officially recognized land use rights, and they learned about the new Forest Code from their functional literacy course. A few women have combined the two and either have or are pursuing land use certificates from the rural council for woodlots that they have established.

Another NRM practice that KAED has had significant success introducing is the improved clay cook stove. KAED reports more than 1,000 of the improved stoves, and users report that they know how to repair and replace their stoves, ensuring sustainability as well as the capacity to teach neighbors.

KAED demonstrates four important attributes that are important to future USAID/Senegal programming:

- Its capacity to establish rural enterprises that are well managed and operate profitably, even though, for some, profitability includes amortization of capital costs whereas, for others, it never will.
- Its capacity to help identify which types of enterprise activities have a good chance of being remunerative or the types of conditions necessary to allow them to operate profitably.
- The experience demonstrates that GIEs, local groups, and co-ops can set up and manage local enterprises that profitably provide basic rural services if they have access to capital and training in functional literacy and financial management. The Senegalese Government has to a large extent disengaged from providing basic rural services under the pressure of structural adjustment, and the commercial private sector has not moved to fill the void. Promoting the provision of basic rural services through these local GIEs provides USAID

programming with a means of helping establish the enabling conditions necessary for productive and profitable agricultural programs within the framework of a liberalized economy or private sector orientation.

- These communal GIEs are an exercise in group/enterprise governance. The training and the process of establishing the GIEs and their enterprises develop many of the skills necessary for improving good governance at the grassroots level. Many, if not most, of the GIEs operate in a manner that demonstrates accountability, transparency, and democratic procedures. This provides an opportunity for significant synergy between SO1 and SO2, particularly if SO2 continues to target the institutions involved in communal decisionmaking at the CR and zonal level. A KAED-like orientation can help provide people-level impacts, as well as help bring better governance to the grassroots level.

## **5.2 Senegal Reforestation Project: A Continuum from SRP to CBNRM**

This set of programs is best viewed as a continuum. SRP was specifically the precursor to the CBNRM program. The two programs have been located in or under the tutelage of the same institution (the Forest Service), organized with nearly the same set of administrative components, and have employed a not insignificant portion of the same staff in some capacity. SRP was extended for two years specifically to serve as a bridge to the CBNRM program and establish a test program examining the feasibility of some key aspects of the CBNRM concept. Both programs share the use of the matching grant approach to finance and provide an incentive for rural populations to undertake NRM activities. Both programs have been based on innovative concepts that had not previously been tested on any significant scale. SRP initiated policy activities related to the Forest Code, which were continued by CBNRM. SRP, under the amendment that funded the test program, also funded the establishment of CONSERE and the effort to begin preparation of the National Environmental Action Plan (NEAP), for which funding was also continued under CBNRM.

The fact of this continuum has had both positive and negative aspects. One of the positive aspects is the possibility of incorporating lessons learned about working at the CR level during the test program in designing and implementing the CBNRM program. The test program experience indicated that the rural council was not representative of the different groups found in civil society in the CRs and that the rural council could not legally establish a bank account and financial management system that would be acceptable to USAID. It also identified the need for training at the CERPs and the need for a literate person to serve an administrative function at the CR level to insure that activity and financial reports were completed and expedited in a timely manner. Another positive aspect has been the continuation of the policy-related activities from one program to the next.

On the negative side, one finds the continued fascination with the matching grant approach. Gonzalez demonstrated and the SRP final evaluation team reinforced the finding that the matching grant approach did not replace the need for other public sector reforestation activities, but rather depended on the framework that other public sector projects provided for its success. The final evaluation of SRP went so far as to say that the matching grant approach was inappropriate for the CBNRM program and should not be used in

CR-level activities. Another negative aspect was the adoption of SRP's highly centralized structure and institutional association, even though CBNRM was not set up to work through the network of local and regional Forest Service offices, which were key to the structure and location being effective for SRP. The appropriateness of this structure and institutional setting became even more questionable after CBNRM was revised, as suggested in the final SRP evaluation, to focus as much or more on promoting decentralization as on promoting NRM.

Although SRP had an innovative approach and a mission to reforest Senegal in the wake of the drought and desertification problems affecting Senegal in the 1970s and 1980s, its reforestation efforts, like those of many other reforestation programs in Senegal, were only moderately effective. Tree survival rates, which, nine to twelve months after planting, were probably in the 50 percent range, have likely fallen below the 50 percent mark in the 10 years since planting was initiated. Even the incentive of a substantial cash payment was only moderately effective in that only 55 percent of plantings achieved the 45 percent survival rate necessary to receive the minimum cash payment. As mentioned above, the matching grant was also not sufficient to get trees planted without the need for other public sector interventions. The program did not provide much support for natural regeneration activities, which typically have proved more effective than reforestation across the Sahel. One reason for this seems to be a historical tendency of forest services across the Sahel to focus on tree-planting activities. Although this tendency has changed substantially in other Sahelian countries, it does not seem to have changed in Senegal, even after extensive training of Forest Service staff. Another reason is that the matching grant approach provided little incentive for activities that had little cost to cofinance.

SRP/CBNRM did have an important impact through their policy initiatives. The two programs were involved in elaborating a new forest code and helped finance a land tenure center study on the likely effects of the proposed Forestry Code. Under the amendment that extended SRP to implement the test program, SRP also financed establishment of CONSERE and the effort to begin the NEAP. CBNRM continued funding for these activities. The NEAP was authorized by a national seminar in September 1997 and was accepted by the government in January 1998. The code, to which SRP contributed, was authorized in 1993. The new Forest Code has been updated twice since then, in 1995 and 1998; the most recent update made was the code compatible with the allocation of responsibility for forest activities set out in the Decentralization Law. CBNRM's whole orientation to operationalize the decentralization policy will undoubtedly have a major impact on the practical application of this policy in future years. The environmental monitoring program of EROS and CSE has a different orientation, but also serves to provide the information necessary to inform decisionmaking and policy formulation.

The SRP test program had an important impact on CBNRM and, therefore, may be expected to have some impact on the future application of decentralization policy. The program found that the rural council was not representative of the diverse groups present in civil society, which resulted in CBNRM's introduction of the NRMCS. Its finding that the CERPs were not prepared for their role in the test program, resulted in the formulation of an extensive training program for the CERPs' staff, animators, and NRMCS members. The problems identified in completing administrative and financial reports on a timely basis resulted in the creation of the animator post to ensure the handling of such reports. One result that is not clear is the sudden reversal on working with individuals or groups. The test program found that

implementing activities through local groups in the test CR was more difficult than the original SRP orientation toward working through individual contracts, whether with a group or individual. This apparently at some level resulted in the rejection of working with groups and the return to working with individuals in the microréalisation phase of CBNRM. CBNRM, however, found that the CERPs and the NRMCs did not have the capacity to provide technical assistance to the large numbers of individuals addressed in SRP nor the capacity necessary to produce a significant biophysical impact. CBNRM then returned to a group orientation in developing the subproject approach and establishing the federations.

CBNRM is attempting to do several things and test several innovations that will have important long-term impacts:

- *Target interventions at the CR level rather than the traditional village level in an attempt to increase the pace at which development programs impact rural Senegal.*
- *Operationalize the decentralization of and local participation in decisions related to land use and NRM.*

It is difficult to say anything about these actions, because they will depend on the long-term results of the program. Toward these ends, however, CBNRM is attempting the following:

- *Design and implement a participatory process of regional planning with a strong environmental component.*

CBNRM has implemented LUMPs for each of the fifteen CRs with which it is presently involved (with an additional five to be done in 1999). The plans for the first generation were neither very participatory nor very good, but the process has improved significantly with succeeding generations of CRs. These LUMPs do provide major elements of regional planning at the CR level and include a strong NRM and environmental component. The plans have a number of elements in common with the regional planning and landscape ecology approaches being developed elsewhere (and the two groups probably can contribute to and learn from each other).

- *Introduce some promising democracy and governance interventions in an attempt to influence institutions and decisionmaking at the CR level.*

People, particularly in the newer generation sites, appear rather happy with the fact that the various socioprofessional groups in civil society are represented on the NRMCs and subcommittees and that local GIEs and groups are represented on the federations. The NRMC seems to be characterized by accountability, transparency, and democratic procedures and is beginning to influence other local institutions, particularly the rural council. It is far from definite, but it is easy to imagine that this process may have a long-term impact on what is considered acceptable practice and procedure among local institutions.

- *Develop a system of representative participation that allows it to use a participatory approach, while working at a level several steps removed from the population.*

CBNRM is attempting to establish a representative structure so that it can more easily work in a participatory manner at the CR level, which is several steps away from the village and the population. The population seems please



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erations will have any loyalty and dedication to implementing a proposal that they had no role in developing.

- *Implement some NRM interventions.*
- *Integrate NRM and income-generating activities in the subproject approach.*
- *Produce people-level impacts that will result in increased incomes.*

In many respects, it is on these that CBNRM faces its greatest challenge. Rural populations are impatient to see the program implement activities that will have a positive impact on their day-to-day lives. That is certainly one of the advantages of some of the KAED type of interventions in local infrastructure, even if that is an expensive way of buying the population's dedication and commitment. Even the potential for people-level impacts is limited using the subproject approach in a situation in which stakeholders do not have access to credit to expand participation beyond what CBNRM can finance. In particular, few

individuals will see any significant increase in personal income from the limited number and scope of income-generating activities planned under the subprojects. Unless the population sees some concrete benefits deriving from the program, they are unlikely to develop any dedication and commitment to either the NRM activities and objectives or the democracy and governance innovations. Without people-level benefits, those aspects of the program may not last long enough to ever achieve their potential impacts.

CBNRM needs to find some ways to attain some "quick victories" in terms of people-level benefits. One route to "quick victories" and increased income is through credit, which is the greatest advantage of and potential

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The Peace Corps seems to have developed a useful activity with the CBNRM funding. Little collaboration or coordination, however, has taken place between the CBNRM program management unit and the Peace Corps on training programs or activity locations. As such, the agroforestry demonstration program that the Peace Corps developed has little relationship to CBNRM CR-level activities.

EROS and CSE have produced a number of GIS-based maps and graphics that greatly improve the understanding of the environmental context in Senegal. They have used innovative procedures for collecting and processing this information and supported the results with ground-based verification and socioeconomic investigations, which help explain the cause or result of observed phenomena. They have used this information to produce thought-provoking projections to help inform policy formulation and decisionmaking. EROS has facilitated the transfer of capacity to continue such monitoring to CSE. CSE has the potential to serve as a central hub, which serves to provide geographic and environmental information to agencies throughout Senegal and possibly neighboring countries as well.

### **5.3 Winrock: On-Farm Productivity Enhancement Program**

The Winrock On-Farm Productivity Enhancement Program (OFPEP) program has remained primarily focused on the use of improved seeds of the primary agricultural crops to enhance agricultural production. More recent Winrock programs use the improved seeds as an incentive to promote simple NRM activities, particularly natural regeneration. Winrock had tried to require that farmers construct a cemented compost pit in its collaboration with NRBAR on soil fertility testing, but found that the cement pit precondition was too restrictive and was wrecking its effective improved seed program. A small revolving fund is now used to purchase improved seed from ISRA for multiplication. Winrock has developed a farmer-to-farmer seed multiplication and distribution system in which participants pass on between 2 and 10 kilograms of seed for each kilogram received to expand the system with little cash cost. The scope of this program seems to be primarily constrained by the limited availability of certified or otherwise high quality source seed, primarily produced by ISRA.

Winrock's mode of operation has some other unique features. Winrock often associates itself with other organizations (other NGOs and the Peace Corps) doing community development work and offers technical assistance and/or support, primarily in agriculture and livestock production, which those organizations do not provide. In this manner, Winrock keeps its limited staff focused on its core areas of technical competence. Winrock also trains and uses voluntary local facilitators selected by the community as their extension agents in the field. This approach has the advantage that these facilitators remain in the community and continue to provide extension advice after the program ends. In a more recent program, Winrock collaborated with the Peace Corps in developing a "seeds for trees" program. Farmers are offered improved seed to plant in whichever area they are willing to protect the natural regeneration of multipurpose tree species, particularly *Acacia albida*, so that the trees are not cut when the field is cleared for cultivation. Winrock and the Peace Corps have had one successful demonstration of the program and are expanding it to five additional areas. Testing on this larger scale may identify the factors critical for successful implementation and positive results that would set the stage for diffusion on a broad scale.

### **5.4 The Rodale Institute and Natural Resource-Based Agricultural Research**

The impact assessment team's primary exposure to the Rodale Institute was in connection with the soil fertility and compost-testing program that it implemented in conjunction with NRBAR. The testing was stopped after the initial introduction of composting in cemented pits. It was not continued in order to work on adaptation of the technique until it is technically, economically, and socially acceptable to farmers.

## **5.5 Southern Zone Water Management Project**

The Southern Zone Water Management (SZWM) project has ended and the impact assessment team could not visit the sites for security reasons. The program constructed high quality salt-protection dikes in twenty-two valleys that apparently are much appreciated, but worked in fewer valleys and returned less acreage to production than planned. Attainment of the program goal was seriously compromised by the closing of SOMIVAC by the Senegalese government, which left farmers in the region without access to basic rural services such as credit, supply of agricultural inputs, marketing, transportation, and extension services.

## **5.6 PVO/NGO Support Project**

The PVO/NGO Support Project has supported more than thirty PVO and NGO programs and the institutional development of more than twenty organizations. Addressing that many organizations was beyond the scope of this assessment.

## 6.0 Technical Findings and Recommendations for Future NRM Activities

This section focuses specifically on the technical aspects of the NRM activities discussed in annex A.

### 6.1 Live Fencing

NRM projects regularly promote live fencing as an inexpensive and biomass-enhancing alternative to metal fencing. This activity has had generally moderate to poor success for a variety of reasons, both technical and logistical, which can often be resolved through improved project performance.

One technical difficulty seems to be confusion on what is a live fence compared with a windbreak. To form a live fence, trees are often planted too far apart (one or two meters) to provide a barrier to animal intrusion, whereas windbreak trees are planted too close together, creating a vegetative wall rather than a partial sieve. In fact, what is often referred to by farmers as either live fences or windbreaks seem rather to be field demarcation plantings, because plant spacings observed often do not serve the functions of either type of planting.

**Recommendation:** Project personnel need to clarify the difference between live fencing and windbreaks.

**Recommendation:** Reduce spacing between trees in live fences to 15 centimeters to half a meter, depending on the species used.

Both activities serve important but distinct purposes and require separate technical approaches. Live fencing is not needed for most rainy season fields as animals are not allowed to roam freely during this time of the year.

**Recommendation:** Only promote live fencing if the crops being planted in the area being protected are of high enough value to justify the time and expense required to plant and maintain the live fence.

*Euphorbia balsamifera*, a popular plant material for live fences, is a good choice for live fencing for the following reasons:

- It is planted in the dry season and, therefore, planting does not compete with other farmer activities during the busy rainy season.
- It establishes quickly if no trampling damage is sustained between planting and rains.
- It is an effective beginning or first step in live fence development.

Thorny tree species selection to be planted in combination with *Euphorbia* include several effective multipurpose trees such as *Ziziphus* and *Acacia nilotica*, which can be used to generate additional revenues (pods of *A. nilotica*, fruit from *Ziziphus*, and so on).

**Recommendations:** Combine *Euphorbia balsamifera* with multipurpose thorny species to create a more effective live fence than can be had using one species alone.

**Recommendation:** Projects should tolerate the use of dead fencing material as a short-term *measure* to fill in gaps while thorny species establish themselves.

Some supplemental dead fencing to fill in gaps while thorny species establish themselves is acceptable. Filling gaps avoids crop damage from animals without causing a multiyear delay in whatever is to be grown within the enclosure.

**Recommendation:** Projects need to reinforce the reality that establishing a live fence is a multiyear activity. dopters will need to follow up by replanting live fencing material and fixing dead fencing for a period of several years.

As mentioned above, moderate use of dead fencing to complement live fencing is acceptable but use of dead fencing as a backup should be reduced each year as live fence gaps diminish.

## 6.2 Field Trees

Field tree plantings, for which trees are intercropped with agricultural crops, are an effective way to increase vegetative biomass in a socially acceptable way. For example, because of increasing population pressures, fewer farmers own sufficient land for their agricultural needs, so despite decreased soil fertility (of which all farmers are aware), it is increasingly difficult to find farmers who are able to convert whole fields to block plantations (thereby taking that field out of crop production) or even who can remove edge sections to establish effective windbreaks. As a result, field tree plantings will continue to grow in importance as an NRM technique.

Protection of natural regeneration has the same ultimate goal as field tree plantings and an increasingly popular NRM activity, particularly for nitrogen-fixing species. For example, the increased discussion about the utility of kadd trees, even in zones where *Acacia albida* has not traditionally existed is a positive trend occurring in Senegal. At the same time, protection of natural regeneration, perhaps due to its simplicity, is still an underutilized technique and should continue to be encouraged.

Farmers often prefer this method to tree planting on their fields because:

- Unlike tree outplanting, staking, painting, or flagging to protect naturally regenerated seedlings or trees can be done prior to the busy agricultural season.

- It requires less effort to protect existing seedlings or trees than to grow, outplant, and protect new seedlings.
- The method has none of the costs associated with a nursery (purchase of pots at 15 FCFA per pot, chemicals, seeds, fencing for the nursery, nursery labor for two to six months, and so on)
- The method leads to higher survival rates. A naturally regenerated seedling that has survived on its own is less likely to die than a newly planted seedling straight from the nursery.

### 6.2.1 Protection of Natural Regeneration

**Recommendation:** Conduct an analysis of the Jig-Jam Association protection of natural regeneration project in the Fissel *arrondissement* to determine how its success can be replicated. The initiative combines a low-cost implementation scheme with decentralization of authority from the Forest Service to villages to achieve significant and sustainable results.

**Recommendation:** Increase promotion of protection of natural regeneration in farmers' fields rather than tree plantings.

In addition to its nitrogen-fixing properties, *Acacia albida* loses its leaves during the rainy agricultural season so it does not compete for sunlight with agricultural crops, which is an added benefit. For farmers who are already paying herders to have their herds manure their fields, feeding the cattle kadd seedpods prior to bringing them to the fields is a small additional step, but one that will have long-term benefits for a field's soil fertility, because the scarified kadd seeds have a higher probability of germinating.

**Recommendation:** Protection of natural regeneration should be emphasized for nitrogen-fixing species such as kadd seeds to increase soil

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Protection of natural regeneration activities can range from the extremely simple to a somewhat more involved process. At its easiest, farmers can leave seedlings rather than remove them as they prepare their fields for the rainy season. To ensure that they see the seedlings when plowing, farmers could paint them or tie on bright flagging. In addition, another level of effort would be to prune off lower branches and then stake the seedlings to encourage upright growth, thereby increasing visibility in a couple of years to a farmer who is plowing. Selective pruning and staking will also encourage upright growth rather than spread, which is a more convenient tree form for a farmer intercropping agricultural crops with trees.

**Recommendation:** As farmers adopt protection of natural regeneration, encourage them to enh  
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Spacing requirements for protection of natural regeneration is similar to field tree plantings, that is, based on the requirements of specific tree species, but a goal of sixty to seventy trees is a good general rule. Natural regeneration, of course, will occur randomly in a field, so a certain amount of flexibility is needed when determining how many and which trees to protect; it is better to have fewer trees that are well dispersed than to have seventy seedlings concentrated in one corner of a field. Also, if the goal is to have a constant supply of multistemmed shrubs and small trees, the total number of trees protected could easily be higher.

### 6.2.2 Windbreaks

Numerous beginnings of windbreaks were observed by the team and are added to as farmers obtain sufficient cash to buy seedlings. Extensively used for windbreaks are fast-growing tree species, including *Eucalyptus* and *Acacia holosericea*, which ensures quick establishment of a windbreak. Unfortunately, *Eucalyptus* has a lot of surface roots, which would lead to more water competition with crops than other

tree species might cause. The main disadvantage of *A. holosericea* is its short life span, which is usually no more than 14 years.

**Recommendation:** Promote the discussion of the need for longer-lived species to be planted at the same time or shortly after establishment of *A. holosericea* to increase the length of impact of existing windbreaks.

**Recommendation:** Reinforce technical comprehension of effective windbreaks, including suitable spacing: five meters between trees and three to five meters between alternating spaced rows, depending on the species.

### 6.2.3 Species Selection

Project staff tend to view trees in reductionist terms, that is, as a live fence, windbreak, or source of construction wood or for their nitrogen-fixing properties. The PRA assessment reconfirmed that farmers have a much more integrated perspective when evaluating tree species, which must be integrated into project activities.

**Recommendation:** As with all NRM techniques using trees, projects need to collaborate with farmers to evaluate species selection in terms of their potential for multiple uses.

**Recommendation:** Collect technical information concerning the nutritional value of A.

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### 6.3 Tree Seedling Nurseries

This does not exist, however, as an indicator for the results review and resource request. Because the success of several of the NRM activities is directly linked to the quality and production timing of nurseries, it is important to examine how they have been managed.

In general, throughout the Sahel, tree planting tends to be associated with National Tree Day, which unfortunately does not occur until early August in most Sahelian countries, including Senegal. As a result, many nurseries base their seedling production on a start-up outplanting date of early to mid-August. If National Tree Day is used as the starting date for planting, often several weeks will go by before all trees are planted because farmers also have time commitments for their agricultural crops. Late August and early September is well into the rainy season; so it is quite likely that these newly outplanted seedlings will receive only a couple of rains before the season ends. National Tree Day should really be a time to do symbolic tree planting, and perhaps a tour of well-planted seedlings from a few weeks prior.

**Recommendation:** Massive outplantings should be disassociated with National Tree Day, because this is generally too late for outplanting to start. Start-up dates for tree nurseries should

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Other than the late start-up date, most nursery managers show a good understanding of general nursery techniques including appropriate soil mixture, filling of plastic pots, seed scarification and sowing, watering regimes, and so on and were moving more and more to selling seedlings, particularly fruit trees, in local markets.

Fruit trees are generally easy to sell in local markets, providing a steady revenue source. Grafted trees provide a higher return because they will produce higher quality fruit as well as early or late bearing varieties, which avoid oversaturated markets.

**Recommendation:** Promote nursery production of fruit trees, particularly grafted fruit trees, in zon  
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## 6.4 Compost

Compost does not necessarily require cash outlays as high as those for fertilizer, thereby increasing access to cash-poor farmers (particularly if compost pits not lined with cement are promoted). As a result, this NRM activity is a positive technique for projects to promote. Farmers with whom the team met reported similar or higher crop yields in compost test plots compared with fertilizer test plots. Furthermore, farmers were pleased with the relative safety of compost: well-decomposed compost does not burn crops as fertilizer can, and less-decomposed compost had a multiyear effect (estimated from 3 to 5 years). In general, the impact of this activity is well understood and appreciated.

**Recommendation:** Continue to encourage farmers to make and use compost on their

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To increase the number of people who adopt compost-making as an activity, however, one needs to increase the accessibility of this activity to a larger group of people; a balance between the ideal technical solution and the socioeconomic reality of rural Senegalese is needed for widespread adoption. One of the ways to do this is to reduce the time and money inputs necessary to produce compost. Some of these variations will lead to fewer nutrients ending up in farmers' fields. If this means, however, that someone who has previously been unable to adopt this practice can now afford to compost, the partial loss is compensated by the overall increased use of compost.

**Recommendation:** Decrease reliance on or promotion of cement-lined compost pits.

**Recommendation:** Increase promotion of unlined compost pits in clay soils.

**Recommendation:** Increase promotion of surface compost piles, particularly in sandy soils, in which unlined pits would cave in. Establish simple fencing (using, for example, *Guiera senegalensis* branches)



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If a project wants cement-lined compost pits as part of the choices available to farmers, one must recognize that they are financially out of reach for the majority of farmers. Most of the farmers visited by the assessment team who had cement-lined compost pits had other jobs (for example, alphabetization instructor for another project and so on), and, as such, had a sufficient outside cash flow to allow them to use this technology. Targeting only those people with outside means will not lead to widespread adoption of compost. Cement-lined compost pits did create a spread effect in some cases, but for surface compost rather than cement-lined pits.

**Recommendation:** Allow establishment of credit program so those interested in cement-lined c o  
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Based on results from the PRAs done by the assessment team, it is obvious that the time required for watering and transporting compost to the fields are major constraints to adopting this activity. It is clear that adoption rates can be significantly increased if these time demands could be eliminated or reduced.

**Recommendation:** Look on donkey carts as an NRM tool. Facilitate a credit program that w o  
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**Recommendation:** To better accommodate farmers' time constraints, change the compost-making season from the dry to rainy season to reduce or even eliminate the necessity of drawing water by hand for the compost pile. Compost would then be applied in the fields during the following rainy season.

## 6.5 Manure

Manure spreading is a traditional practice known and familiar to farmers. As such, it will always be difficult to attribute adoption rates to a particular project.

**Recommendation:** USAID should discontinue using manure as an indicator for natural resour  
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## 6.6 Improved Seeds

Based on PRAs conducted by the assessment team in WINROCK and Rodale sites, it was apparent that improved seeds are highly regarded by farmers, more seed would be used if available, and a "revolving

credit" management system works well for seed repayment after harvest. The flexibility shown from area to area as to how high the payback in seeds should be allows one to take into account the local ability to pay compared with the local demand for the seeds. The revolving credit approach allows sustainability in the short term; however, as improved seeds can only be passed on for approximately three generations before an infusion of new improved seed is required, a long-term solution is needed.

**Recommendation:** Encourage establishment of a formal, improved seed distribution system through the private sector to ensure long-term sustainability of improved seed use.

## 6.7 Improved Cook Stoves

Overall, the promotion and adoption of improved cook stoves is a strong success across projects. Most villages surveyed during this mission indicated almost universal adoption, and several mentioned that they were the source or recipients of cook stove training techniques in or from surrounding villages, which indicates that a strong spread effect is occurring.

Good reason exists for the high adoption rate of cook stoves among those introduced to the practice. After all, cook stoves:

- Cost little
- Are easy to repair (and repair techniques are easily mastered by stove owners, which helps ensure sustainability)
- Reduce the need for fuelwood by at least a third (according to most women interviewed, the savings are often closer to a half)
- Reduce cooking time, reduce the danger of children falling into a cooking fire, reduce the danger of women's clothing catching fire, reduce the amount of detritus that blows into the cooking pot, and so on.

In short, the huge time savings these cook stoves represent to women helps explain the high adoption rate. Furthermore, projects should be equally enthusiastic about increasing the adoption rate of cook stoves—the 33 to 50 percent reduction in the adoptee's fuelwood consumption undoubtedly has a more positive impact on maintaining and improving tree biomass levels than the reforestation efforts so heavily promoted by projects in the same zone.

**Recommendation:** Projects and USAID should make the promotion of improved cook stoves among their highest NRM priorities particularly in the short to mid-term.

One of the few drawbacks of cook stoves mentioned by women is the need to repair clay cook stoves, for which they must wait until after the seasonal ponds start to recede so they can get clay for repairs. Mobile stoves or stoves made out of metal would not have this disadvantage. Although many women prefer clay cook stoves because women themselves can make them, some women would be willing to pay for a metal stove to avoid having to make annual repairs.

**Recommendation:** Encourage production of additional cook stove styles to appeal to an even wider audience. Specifically, promote metal cook stoves in

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Construction of metal stoves could easily evolve into an income-generating activity either for an individual metalworker or coordinated by a women's group. Women contract with a metalworker to make a certain number of stoves and then sell them in local markets either at full price or at a reduced rate on credit. Interest from this short-term loan would be rolled back into the women's fund.

**Recommendation:** Provide training for local metalworkers to learn how to construct metal cook stoves.

**Recommendation:** Add a revolving credit program for women to facilitate stove purchases and/or facilitate women's groups in establishing their own stove credit program.

## 6.8 Woodlots

Woodlots have been promoted for years in numerous villages, so many farmers are quite familiar with this NRM technique. As a result, they are generally technically well executed, with a preponderance of *Eucalyptus camaldulensis* plantings. It is interesting to note that when *Eucalyptus* was first planted in Senegal, many women objected to using it for fuelwood because of the acrid smoke, so it was grown almost exclusively for construction wood. Yet, it is clear that, over the years, more and more women are willing to use *Eucalyptus* wood for cooking; as a result, woodlot production now goes to both construction and fuelwood needs.

Because of the demand for cultivable land, however, woodlots are not always feasible. Farmers in the areas that the team visited discussed the increasing difficulty of having fallow fields. Block plantations, unlike border plantings or other configurations, require a quasi-permanent land-use change from agriculture to tree production. Growing land pressure suggests that fewer and fewer farmers will be able to convert entire fields to tree production and still meet their agricultural needs, particularly in the coming decades). The possible exception to this is older farmers who have more land than they can actively farm and find tree production a convenient labor-saving way to continue maintaining productive use of their land. As such, they would avoid accusations of having "abandoned" a parcel of land (and potentially having it re-assigned to someone outside the family), while ensuring a lower but easier income flow than other crops as the farmers age.

**Recommendation:** Recognize that due to increasing land pressure, farmers will be less likely to adopt woodlot or block plantations in the future. As such, emphasize other NRM activities instead of woodlots.

## 6.9 Erosion Control

Numerous beginnings of rock bunds are occurring, particularly in the Saloum area of Senegal. This is an important activity given that water infiltration is often a problem during the heavy but brief rains typical of the Sahel. It is also a difficult activity to undertake, requiring a lot of labor and, in many cases, coordination among neighbors.

**Recommendation:** Tie in this long-term activity with one that will produce results in the short term, for example, improve seed selection, encourage farmers to participate in rock bund construction.

**Recommendation:** Provide credit programs to facilitate the purchase of carts that can be used for the transport of rocks.



## 7.0 Summary of the Cost/Benefit Study of NRM Practices

### 7.1 Financial Analysis

This report presents the financial and economic analysis of improved NRM technologies extended throughout Senegal with USAID support, including (a) composting, (b) live fences, (c) field trees, (d) rock dikes, (e) woodlots, and (f) improved wood stoves. The results were aggregated in accordance with the adoption rates determined through the 1992, 1994, 1996, and 1998 KAPs to estimate if USAID's investments have generated positive returns (economic feasibility) as a whole. An analytical model was developed on Lotus 1-2-3 for the purpose of the analysis. All farmer-perspective results are expressed in terms of net present value (NPV) and internal rate of return (IRR).

**Table 3. Financial Analysis Base Case Per Hectare Results**

Technologies	NPV (FCFA)		IRR (percent)	
	Fatick	Kaolack	Fatick	Kaolack
Composting	34,902	60,893	NA	NA
Live fences	290,895	342,138	56.2	69.6
Field trees	16,477	18,096	52.4	53.8
Rock dikes	-3,874	22,962	27.8	NA
Woodlots	12,157	26,381	33.8	37.9

Note: NA = not applicable.

#### 7.1.1 Composting

Three composting alternatives were analyzed: (a) the base case (composting only, no other physical inputs), (b) composting plus phosphates, and (c) composting plus phosphates plus improved seeds. The base case costs included labor only, valued at the opportunity cost of time for constructing the pit, plus filling, watering, and emptying it. One quantifiable benefit was assumed—the extent to which crop yields increase as a result of applying two tons of compost per hectare, every other year. For the more intensive alternatives (2 and 3), the NPVs increase considerably as indicated below in table 4. It is obvious that the addition of the phosphate and improved seed inputs generate a substantial boost in the economic attractiveness of composting as indicated by the relatively large differences among the NPVs.

**Table 4. Composting NPVs Per Hectare, All Technical Alternatives**

Alternatives	Fatick		Kaolack	
	NPV	IRR	NPV	IRR

1. BASE CASE (Composting only)	34,902	NA	60,893	NA
2. (Composting + phosphates)	101,751	NA	153,718	NA
3. (Composting + phosphates + improved seeds)	157,272	NA	232,345	NA

Note: NA = not applicable.

### 7.1.2 Live Fences

Three technical alternatives (in a 50 by 50 meters or 2,500 m<sup>2</sup> configuration) were analyzed:

- *Salane* (*Euphorbia balsamifera*) fence only
- The base case, one row *salane* plus one row *Acacia leatea* trees (better protection and value added from the seeds)
- One row *salane* fence plus two rows *Acacia leatea*.

Labor for site preparation, planting, replanting, and maintenance, both for the fence perimeter and inside the enclosed area, was valued at the full opportunity cost of time (800 FCFA per day). A 20,000 FCFA per hectare opportunity cost of land was also assumed, reflecting grazing values foregone. The benefits are derived from both the perimeter fence and from the crops grown inside the enclosures, notably fuelwood, poles, and seeds from the perimeter fence, and manioc from inside the protected area.

The per hectare result for the base case indicates strong financial feasibility, largely because the fence itself generates greater financial benefits than the manioc grown inside the enclosed areas (this, of course, raises the prospect of considering *Acacia laetea* woodlots to maximize seed production instead of a live fence configuration). The NPV results for the other technical alternatives (1 and 3) are summarized in table 5 below. For alternative 1, the NPV is negative because the *salane* perimeter fence provides protection only. For alternative 2, the NPV is high because more seeds, fuelwood, and poles are produced than in the base case alternative. The results clearly indicate that the investments in live fences can only rarely be recovered from the values of high value crops generated inside the enclosures and must include values from the perimeter fence as well.

**Table 5. Summary of NPVs per Hectare, Live Fence, All Technical Alternatives**

Alternatives	Fatick		Kaolack	
	NPV	IRR	NPV	IRR
1. (1 row <i>salane</i> fence)	-92,019	NA	-92,019	NA
2. BASE CASE (1 row <i>salane</i> , 1 row <i>Acacia laetea</i> )	290,895	NA	342,138	NA
3. (1 row <i>salane</i> , 2 rows <i>Acacia laetea</i> )	683,943	NA	684,706	NA

### 7.1.3 Field Trees

On the cost side, the typical stocking density of kadd trees is four adult trees per hectare or some sixteen trees short of the optimal twenty trees. The investment required consists of (a) labor (preparing the site and

continued surveying to keep livestock away) and (b) the opportunity cost of land (the land area displaced by the trees). The benefits include increased crop yield and sale of pods and leaves. As indicated in table 3, the field tree technology is financially feasible in both regions because the NPVs are positive.

#### **7.1.4 Rock Dikes**

The cost assumptions include (a) labor valued at the full 800 FCFA opportunity cost of time per day and (b) transportation of the rocks from the mining site to the farmfields (by charettes). The increases in crop yield relative to declines in crop yields without the intervention comprise the benefits. Given the assumptions (100 meters of rock dikes per hectare), installing rock dikes is financially feasible in the Kaolack region and almost so in the Fatick region. For the latter, the NPV is only slightly negative. The heavy labor expended in the process of mining, transporting, and installing the rocks along the contours in the fields appears to be offset by the value of the crop yield increases obtained as a result.

#### **7.1.5 Woodlots**

Revegetation of the farm landscape with woodlots is an option often exercised by farmers, particularly if tree production outperforms food production in economic terms and/or it reduces risk due to diversification of the farming system. On the cost side, the base case considered three main variables: (a) physical input costs, consisting of tree seedlings, (b) labor for planting, replanting, weeding, and protecting the stand once installed, and (c) the opportunity cost of land. (For the base case, it is assumed that the opportunity cost of land is zero. Trees are typically grown on marginal land where other crops will not grow well or on areas not used intensively for other purposes.) On the benefit side, fuelwood and poles are produced in accordance with the intensity with which the woodlots are managed. The results obtained for the base case (table 3) indicate an IRR of slightly less than 34 percent in the Fatick region and 38 percent in the Kaolack region.

#### **7.1.6 Improved Wood Stoves**

Promotion and dissemination of improved wood stoves is widely held to be a much more cost-effective way to save wood as opposed to producing more to meet population-driven increases in demand over time (the improved stoves are known to save more than 25 percent of the wood regarding the three-stone stove). The only cost variable is labor for building the clay stoves valued at the opportunity cost of time. On the benefit side, two variables are included: (a) labor saved as a result of using the improved stove and (b) wood savings (the difference between the thermal efficiency of the three-stone and improved stoves). The results are summarized in table 6.

**Table 6. Improved Stoves, Savings per Household**

<b>Results Per Household</b>	<b>Fatick</b>	<b>Kaolack</b>
Wood consumption per household, three-stone stove ( <i>kilograms/year</i> )	1,445	1,445
Wood consumption per household, improved stove ( <i>kilograms/year</i> )	1,332	1,315
Wood saving per household ( <i>kilograms/year</i> )	114	130
Time spent collecting fuelwood per year for three-stone stove ( <i>hours</i> )	365	300
Opportunity cost of time per year collecting fuelwood, three-stone stove ( <i>FCFA</i> )	36,500	30,000
Time spent collecting fuelwood per year for improved stove ( <i>hours</i> )	336	273
Opportunity cost of time per year collecting fuelwood, improved stove ( <i>FCFA</i> )	33,626	27,300
Opportunity cost of time saved per year per household ( <i>FCFA</i> )	2,874	2,700
Opportunity cost of time saved per day per household ( <i>FCFA</i> )	7.9	7.4
Investment in improved stove, labor ( <i>FCFA</i> )	400	400
Stove use needed to recover investment (opportunity cost of time) ( <i>days</i> )	51	54

## 7.2 Aggregate Economic Analysis

For an average time span of some 7.5 years, USAID's support to NRM amounted to approximately \$81.3 million for the SRP, PVO/NGO, NRBAR, KAED, and CBNRM activities combined. A fraction of these investments is spread evenly over the first 7.5 years of the assumed 15-year analytical time horizon, based on an allocation of the budgets among the five NRM technologies analyzed (wood stoves excluded). It was assumed that PVO/NGO, NRBAR, KAED, and CBNRM are or were all involved with extending or promoting the full range of NRM techniques, not only the ones discussed here. The SRP activity was involved with tree plantations and some improved fallow schemes. Each NRM technology was allocated an assumed 5 percent of the total budget or 25 percent of the total budget for the five technologies, leaving the remaining 75 percent divided among the other technologies tracked by the KAP surveys. A total of one-third of the SRP budget was assumed to cover the woodlots of the kind of plantations envisioned in this study in only the two regions. The adoption rates of the five technologies were measured by the differences between KAP 1992 (or 1994) and 1998, as follows: (a) composting, 7.1 percent, (b) live fences, 12.3 percent, (c) field trees, 29.6 percent, (d) rock dikes, 13.5 percent, and (e) woodlots, 13.8 percent.

The economic feasibility of USAID's investments in NRM support to SO2 is estimated in summary table 7 below. The table shows the aggregate net cash flows for all of the technologies derived from the financial analysis. The first total column reflects the base case in which the 5 percent allocation of the budget is invoked (i.e., 5 percent of the total funding level for each activity allocated to each of the technologies for a total of a 25 percent budgetary allocation for the five technologies combined). The 38.4 percent estimated IRR (EIRR) result indicates strong economic feasibility. If the budgetary allocation were doubled to 10 percent (i.e., a 50 percent budgetary allocation for the five technologies combined), the EIRR would only reduce to 30.9 percent, still a strongly feasible result. In the last column, the budgetary allocation is increased yet another time—to 15 percent. The result is still strongly positive as indicated by the 25.7 percent EIRR, well above the assumed 15 percent aggregate opportunity cost of capital. It can be

concluded, therefore, that USAID's investments in NRM over time have been strongly economically feasible.

**Table 7. NPV Results, Global SO2 Support (FCFA)**

Year	Aggregate Net Cash Flows					Total		
	Composting	Live Fences	Field Trees	Rock Dikes	Woodlots	5%	10%	15%
1	-375741171	-923973577	-511512689	-897584550	-867350825	-3576162812	-4997552850	-6418942888
2	-333388677	-916362149	-667677869	-687152400	-1072957188	-3677538282	-5098928321	-6520318359
3	-285916994	-1065460939	-823843049	-466986581	-1175057721	-3817265284	-5238655322	-6660045361
4	-233454102	-959445358	-642007901	-237330435	-1262515054	-3334752850	-4756142889	-6177532927
5	-176124782	909289679	-214341062	1578780	1628514663	2148917277	727527239	-693862800
6	-114050693	2998773268	241656469	249509736	1541057329	4916946110	3495556071	2074166033
7	-47350456	4867508305	767592821	506236892	1453599996	7547587558	6126197520	4704807481
8	389404617	7596652437	1796898093	1398006370	1799818075	12980779593	12980779593	12980779593
9	454033667	9745894794	2587671171	1837574151	2248839335	16874013117	16874013117	16874013117
10	489017833	11906122065	3417176973	1904093340	5913033141	23629443352	23629443352	23629443352
11	523127396	13796398706	4126817368	1968949551	5920354741	26335647761	26335647761	26335647761
12	556384219	14898506986	4593676510	2032184356	4431111216	26511863287	26511863287	26511863287
13	588809622	14788132710	4993393282	2093838291	2941867691	25406041595	25406041595	25406041595
14	620424389	14898506986	5382708022	2153950877	2941867691	25997457965	25997457965	25997457965
15	651248788	14788132710	5730414634	2212560649	6539665381	29922022163	29922022163	29922022163
NPV						32701996917	26788417751	20874838586
EIRR						38.4%	30.9%	25.7%

## 7.3 Recommendations

- For *composting*, (a) continue to promote composting in combination with the application of phosphates and improved millet seeds as indicated by the much stronger financial results, (b) through the SO1 portfolio, promote private sector initiatives to produce and sell essential farm inputs such as phosphates and improved seeds, (c) promote composting during the rainy season to minimize the need for watering or using scarce water that otherwise has a high opportunity cost, and (d) demonstrate the differences between cement pit and above-the-ground composting in terms of the physical impacts on crop yields, the investment burdens associated with both, and the economic returns.
- % For live fences, (a) continue to promote live fences, using salane only when it protects a highly valued cash crop and preferably encourage salane in combination with the more valuable thorny species, (b) in the course of promoting live fences, distinguish between the costs and benefits of the perimeter fence itself and the costs and benefits derived from the crops it protects (based on the strong feasibility results, it is clear that the perimeter fence is potentially far more commercially valuable than the crops protected inside the enclosures), and (c) promote live fences through physical demonstration and perhaps video production

in which the differences in the potential for generating incomes should be highlighted.

- % For *field trees*, (a) continue to promote the technique of field trees (kadd protection) in view of the financial attractiveness to participating farmers and because kadd protection is already part of the farming culture and tradition in Senegal and (b) promote the technique in combination with other technologies on the same farm fields, notably composting and/or rock dikes to the extent possible.
- % For *rock dikes*, (a) continue to promote the technique of stemming water erosion by constructing rock dikes along contours in farm fields prone to such erosion in view of the financial attractiveness to participating farmers, particularly in areas where ample supplies of nearby rocks can be easily mined, (b) in other areas prone to heavy water erosion but with no nearby source of rocks, the same technique should be promoted through a judicious application of matching grants calibrated to the results of the financial analysis of the intervention in those areas and/or promote alternative anti-erosion techniques such as bands of vetiver grass and others.
- % For *woodlots*, (a) continue to promote short rotation private woodlots in the context of a firm understanding of the markets for the wood, particularly fuelwood and poles, and (b) investigate different woodlot configurations using different species combinations and technical options to determine the extent to which each increases farmer incomes.
- % For *improved stoves*, USAID should continue to extend through CBNRM or other activities present and future the adoption of improved wood stoves throughout Senegal.

## **8.0 Summary of the Use of a Participatory Approach in Program Implementation Strategies**

### **8.1 Introduction**

This report focuses on an analysis of the implementation strategies of four USAID/Senegal–financed natural resource management projects (the Rodale Institute, Winrock's OFPEP, KAED, and CBNRM) to determine if the projects used a participatory approach and if each project's approach will engender or discourage sustainable benefits in Senegal's rural sector. The findings, conclusions, and recommendations found in this report are meant to complement the findings and analysis provided by other team members of the impact assessment team.

The bulk of this report was devoted to an analysis of the ongoing CBNRM project, as per the Mission's request, and because it is the only project currently in operation. In the course of the four-week assignment, the PRA/RRA team visited a total of twenty-two project sites (villages, zones, or CRs) where each of the four projects had intervened. The team visited two Rodale NRBAR sites, two Winrock NRBAR sites, seven KAED sites, and eleven CBNRM sites.

The team used the appreciative inquiry approach to gathering information when working with project stakeholders. The team met with the various groups of informants to "catch someone doing something right" by working with them to determine which aspects of the projects were successful and should be used by USAID when it designs new projects.

### **8.2 Participation as an Implementation Strategy**

Participatory approaches are generally accepted as being the most effective means for projects to realize sustainable impacts in the NRM sector in the Sahel. Projects that engage in participatory processes usually end up being both entrepreneurial and empowering.

Participatory projects are entrepreneurial, because they effectively identify and meet their customers' needs in a timely manner. Projects using participatory approaches ensure that the project is and is perceived by its beneficiaries to be relevant, feasible, appropriate, and in the real and felt interest of beneficiaries in the short, medium, and long term. Participatory approaches assure that project interventions respond to rural producers' needs, as opposed to project and/or government agency needs. This point cannot be overemphasized because most "top-down" NRM projects tended in the past (and most still do) to impose activities at the village level that were either irrelevant, inappropriate, or even in direct contradiction to rural producers' interests.

Projects using the participatory approach help rural producers empower participants because they create an enabling environment in which participants successfully analyze and resolve problems that heretofore

were beyond their means to address and solve. Participatory projects are designed and implemented to encourage all stakeholders to focus on life "after LOP" (life of project) to ensure that project beneficiaries acquire the skills, experience, confidence, access to resources, and standing (social and/or legal) necessary to continue the problem-solving processes initiated under the project's auspices.

### **8.2.1 An Operational Definition of Participatory NRM Projects**

Table 8 on the next page presents an operational definition of participation based on the major tasks performed during a typical project cycle of a model participatory project that is both optimally entrepreneurial and optimally empowering. This operational definition of participation (ODP) table is adapted from similar tables used to help clarify major stakeholders' roles and responsibilities in participatory NRM projects in Niger. The table was adapted to reflect the unique challenge faced by CBNRM staff as they attempt to scale up the impacts of the traditional village-based participatory *gestion de terroir* NRM project by focusing its intervention at the *communauté rurale* level rather than the village level.

Participatory NRM projects in the Sahel to date have focused on the village or the *terroir* level. As such, projects and programs have been able to link directly with their customer—the rural producer. An ODP of such projects would not necessarily differentiate between the two levels of planning as the model ODP table does, because the stakeholders would have the same role to play at both levels. The village-based NRM approach has proved extremely effective but highly costly in terms of time, specialized labor, and resources. The approach, although extremely promising, does not seem to be replicable on a national, let alone Sahel-wide, scale. Most participatory NRM projects impact between twenty to fifty villages. Most such projects do enjoy a healthy spread effect, yet they still cannot be expected, as currently designed, to have a great enough impact to stop or reverse environmental degradation.

USAID responded to the shortcomings of the village-based participatory NRM projects by designing the CBNRM project to focus at the *communauté rurale* level. The project is intended to create the enabling conditions throughout the CR necessary to promote sustainable NRM by introducing participatory processes and promoting human resource development at that level. The project designers assumed that by training and supporting CR-level stakeholders, the project could enjoy a multiplier effect as these individuals would replicate the project's participatory process at the grassroots level. This process is often referred to as "scaling up."



**Table 8. Operational Definition of Participation: The Model**

C	=	Control ( <i>pouvoir de décision</i> )
I	=	Influence ( <i>appui</i> )
A	=	Appreciation
N	=	None ( <i>néant</i> )
NA	=	Not applicable

Major Tasks in Project Cycle	Rural Promoter	Other Rural Producers	NRMC	Govern-ment	Project
<b>1. Planning at the Project Level</b>					
Problem identification	I/C	I/C	C	I	I/A
Analysis of solutions	I/C	I/C	C	I	I
Long-term planning/LUMP	I/C	I/C	C	I	I/A
Conception of subprojects	I/C	I/C	I/C	I	I
Development of <i>cahiers de charge</i>	I/C	I/C	I/C	I/C	I
<b>2. Planning at the Activity Level</b>					
Problem identification	C	I	I	I	I/A
Examining alternative courses of action	C	I	I	I	I
Preparation/submission of proposals	C	N	A	A	A
Selecting proposals	I	A	C	I	I/A
<b>3. Implementation</b>					
Letting contracts	C	A	I	I	A
Labor	C	I	A	A	A
Technical assistance	I	A	C	C	I/A
Managing activities (subproject)	C	I	I	I	A
Monitoring activities	C	C	C	C	I
<b>4. Other</b>					
Training	C	I	I	I	I
Environmental monitoring	C	A	C	C	I/C
Evaluation of overall project activities	C	I	C	C	C
Relations with exterior (outside project)	C	C	C/I	I	C

A shorthand way to describe the difference between the village-centered projects and CBNRM's CR-centered approach is to refer to the former as a direct-link project and the latter as a representative-link project. The direct-link project is characterized by direct and consistent contact between paid project personnel and grassroots stakeholders. The grassroots stakeholders can interact with the project as individuals (who interact with and benefit from the project on an individual basis) or as a group. Groups are generally based on preexisting organizations or on village-based organizations. The representative-link project (of which CBNRM is the only example to date) is characterized by direct contact between paid project personnel and intermediary representatives of grassroots stakeholders.

The key question to consider when analyzing whether CBNRM will have a sustainable impact on Senegal's NRM sector is whether a representative-link project will be entrepreneurial and empowering for a critical

mass of stakeholders in the project's zone of intervention (the CR). Will the project's resources, approach, and training create the conditions in which NRM, CERP, subcommittee members, promoters, and grassroots stakeholders will be willing and able to fulfill their roles and responsibilities as described in the model ODP?

### **8.3 Conclusions On NRBAR Activities (the Rodale Institute and Winrock)**

The team focused on a minor portion of Rodale's and Winrock's activities linked to NRBAR testing during the course of this assignment. The following are the major points concerning the impact that Rodale's and Winrock's approach (under the auspices of NRBAR) had on the degree of participation enjoyed by the rural producers and the project's sustainability.

- The project was minimally entrepreneurial because the technological package was developed at the project level and extended to villagers without true input from villagers at any point in the project planning process.
- The project was minimally empowering to villagers as a whole, although, outside of providing training in the technological package, the project did not concern itself with most aspects of involving villagers in most phases of the project cycle.
- The most important positive impact of the Rodale NRBAR project on the village visited by the team was the support provided by the project to the village facilitator. An unintended consequence of the project's support of the facilitator is that he was elected to the CR, which can now benefit from having a project-trained member.

The team noticed little spread effect from project-introduced innovations in the villages visited.

This lack of spreading indicates a danger that was anticipated by practitioners once the use and adoption of participatory methodologies was widespread. Bara Gueye (1999) and other pioneers in the field of participatory methodologies, have warned that the benefits accruing from the participatory approach are not due to the rote application of a series of tools but are based on the sincere acceptance of the value of participatory tools by all parties involved.

### **8.4 Conclusions Concerning KAED**

The following are the major issues pertaining to the impact of this KAED project's approach on the degree of participation of villagers:

- Use of PRAs as a diagnostic tool
- Use of GIE as an organizing principle
- Creation of the demonstration fields as a means of generating working capital and providing a practical laboratory for organizing work
- GIE training

- Functional numeracy and literacy classes
- Linking GIEs with financial institutions.

The following aspects of KAED's implementation strategy limited long-term sustainability:

- Limiting the scope of rural producer decisionmaking power
- Excluding GIE members from the contracting and procurement process
- Excluding GOS officials from the project process.

The project's participatory approach was strong when it included villagers in the process, although the project's operational approach appears to have focused too much on operational efficiency during the life-of-project period and not enough about GIE operational efficiency once the project ended. The project's decision to short-circuit the participatory process during the implementation phase and the decision to exclude GOS officials from project operations will have negative long-term impacts on any benefits accruing to the participants<sup>27</sup>. The project was only fully operational for three years, which cut short many nascent group-building activities by GIEs that would have led to a greater impact overall.

## 8.5 Conclusions Concerning CBNRM

The project is to be applauded for its innovative approach to promoting participatory NRM at the CR level (despite the areas needing improvement identified below).

- The project staff has shown itself capable of learning from its operations and seeks continuously to improve its operations.
- The project's approach in later generation CRs is superior to its approach in first generation CRs, which indicates room for optimism.
- The project's decisionmaking processes are currently too highly centralized, which has resulted in (a) exclusion of CR-level and grassroots-level stakeholders from the participatory process, (b) project activities that reflect project personnel's approach to NRM rather than grassroots stakeholders, and (c) late implementation of project activities, which impedes their effectiveness.
- Project representatives have failed to maintain a participatory development approach when collaborating with grassroots-level beneficiaries and have reverted to traditional top-down, directive interaction, which has undermined the project's efforts to empower grassroots-level stakeholders and has minimized any benefit
- The later generation version of the project-level planning phase more closely reflects the model ODP and appears to include a critical mass of stakeholders up to the problem identification task of the project cycle.

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<sup>27</sup> The author critiques KAED's decision to exclude local-level GOS officials from project operations, while fully understanding the rationale and temptation to do so.

- First generation PRAs and LUMPs did not include a critical mass of grassroots-level participants sufficient to have a beneficial impact at the grassroots level.
- The subproject approach unnecessarily excludes grassroots-level beneficiaries from the participatory process, which minimizes their empowerment.
- Promoters are excluded from the analytical and skill-building components of the project implementation phase (analysis of alternative actions, letting bids, and managing contracts), which negatively impacts grassroots empowerment, the relevance of the project activities to promoters' and grassroots stakeholder needs, and the project's sustainability.
- The project's implementation process is overly long, even in terms of a participatory project and discourages grassroots collaboration because of the extensive up-front commitment required. This is especially true because grassroots stakeholders are not actual partners in the planning and implementation process.
- There are no formal established procedures for identifying and resolving differences among project stakeholders concernin
- Individual communication from the PMU to the CERP and NRMC is generally regular and effective and promotes participatory development, given the constraints on PMU staff time, due to the project's centralized location.
- Communication from project representatives to the grassroots level is irregular, ineffective, and contrary to participatory development.
- Few grassroots-level activities have been initiated under the project's auspices, except for a limited amount of functional literacy training. The impact of these activities to date has been negligible.
- The team witnessed minimal spread effect for all activities.
- Grassroots-level activities are often marginally relevant to promoters' and villager priority needs and interests. Congruence between promoter needs and subproject objectives often occurs through happenstance and not through conscious attempts by project representatives to customize project activities to meet beneficiaries' needs.
- Activities are often neither designed nor implemented to reflect grassroots-level stakeholders' managerial, financial, and technical capacities.
- Promoters feel little ownership for the activities for which they are ostensibly responsible.
- The project's credibility with grassroots stakeholders is hurt, because the stakeholders do not understand the conditions under which they collaborate with the project and why their cost of participation increases with each change.

## 8.6 Recommendations for CBNRM

- Decentralize decisionmaking to the extent possible. Strategies to promote decentralization include establishing offices outside of Dakar, selecting

representative bodies at levels lower than the CR, and creating personnel monitoring and incentive systems that reward "participatory" behavior by project personnel.

- % Redefine NRM activities to reflect rural producers' integrated food security perspective in which "NRM" and "income generation" are indistinguishable. Include credit as a project resource for use by project participants.
- % Calibrate project activities to coincide with Senegal's agricultural calendar, not USAID's calendar.
- % Maintain the participatory process throughout the project cycle rather than ending it after the problem identification phase. Increase the grassroots-level stakeholders' role as partners in the participatory NRM process by including them in all tasks, especially the design of grassroots-level activities and the management of grassroots-level activity contracts.
- % Focus project resources on implementing project activities in current CRs rather than expanding into new CRs.
- % Revise the project's CR-level project cycle to reduce time between the beginning of the planning process and the implementation of village-level activities by moving the locus of decisionmaking for grassroots-level activities to the CR and grassroots level and by developing easy-access collaborative activities to complement the participatory process.
- % Explore connecting with more traditional direct-link projects that can focus more project resources at the grassroots level.
- % Create a USAID-project communication and consultation link to improve relations.

## **8.7 Overall Recommendations to USAID for Future NRM Activities: Lessons Learned**

- Design NRM projects with a ten-year time horizon.
  - % USAID should develop a standardized "participation checklist," which it would use to conduct regular customer satisfaction surveys with project participants to ensure that putative participatory projects are actually participatory.
  - % USAID should establish a coherent project policy environment that promotes individual initiative, while respecting the project's limitations.
  - % USAID should embed democracy and governance activities within larger, service delivery projects.
  - % USAID should develop a Mission-level policy concerning Government of Senegal involvement in projects, to which projects must adhere.

“ USAID's activities funded under the Mission's old SO2 and planned SO1 and SO2 need to be integrated to increase project impacts and sustainability.

- Promote the legal standing of local language contracts.
- Promote the status of local representative bodies (subcommittee and federations) such as GIEs
- Promote the creation of private sector service providers to support rural development activities.

## **8.8 An Example of a Successful Community-Based Project**

Jig-Jam is a local association dedicated to rural development in the Fissel Rural Community in the Mbour region. The association has been in existence since 1974 and has funding support from Oxfam for a variety of activities it has undertaken.

Jig-Jam completed a reforestation project in 1994 that was not successful. Jig-Jam staff conducted a needs analysis with local rural producers. Their findings included the following:

- General awareness existed on the causes and consequences of environmental degradation.
- Rural producers wanted to do something to improve soil fertility.
- Traditional reforestation approaches were not appreciated by villagers.
- Protection of natural regeneration, especially kadds, seemed feasible.

Jig-Jam, in collaboration with village associations, helped organize a scheme for village-level protection of natural regeneration. Jig-Jam helped create an auxiliary force of "forest guards" to whom the Forest Service has ceded the right to levy fines for illegal cutting of kadds. Now, "auxiliaries" operate in thirty-one villages and are paid 2,500 FCFA monthly. The size and importance of fines has increased from 3,000 FCFA to 30,000 FCFA with auxiliaries remanding several people to the Forest Service for jail sentences in Mbour for three months. In addition, Jig-Jam used its rural radio system to broadcast information about how kadds were to be protected by the villages and why the local associations felt the need to undertake this operation.

Informants indicate that their efforts have not only led to a strong regeneration of kadds but that the CR of Fissel has more rain because of the kadds. Whereas the first claim was verified and the second one could not be, it is important to note that local people were now linking the presence of trees in their area with positive environmental impacts, which is a refreshing change from the usually onerous task of having to interview rural producers about the negative impacts on their lives brought on by the absence of trees.

Results from an annual investment of \$1,860<sup>28</sup> in a four-year period include:

- A visible increase of kaddis at the CR level in Fissel with attendant increased agricultural productivity in thirty-one villages
- Improved links between rural producers and the Forest Service (the latter has come to be viewed as a partner in development)
- Decentralized governance in action with benefits accruing to rural producers
- A NRM success that is entirely due to local efforts.

The activity has many of the characteristics of a participatory NRM intervention planned by rural producers for rural producers. As such it is:

- Low cost
- Low risk (no opportunity costs)
- Promotes food security
- Based on rural producers' priorities
- Technically and operationally feasible given rural producers' constraints.

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<sup>28</sup> Which is less than the investment required for a 1-hectare monoculture woodlot.

## 9.0 KAP Results

### 9.1 The KAP Household Surveys

To track changes in the use of NRM practices and the context for improving NRM, USAID/Senegal funded a series of knowledge, attitudes, and practices surveys in 1992, 1994, 1996, and 1998. The KAP surveys were intended to contribute to understanding the relationship between USAID's programmatic activities in the sector and the impacts of those programs on the behavior of rural producers. As part of the SO2 impact assessment, the IRG team was asked to assist in generating sound information from the 1998 KAP survey and to review the combined results from the four KAP surveys. One of the leading objectives of the IRG team review was to "identify, where possible, the causes, reasons, purposes, and logic for use and nonuse of improved AG/NR practices and technologies."<sup>29</sup>

The initial 1992 KAP survey included 1,377 households in the four regions of the target zone of Fatick, Kaolack, Tambacounda, and Kolda. The 1994 KAP survey included 2,006 households within the target zone, whereas the 1996 KAP survey included only 702. Although earlier KAP surveys included samples in Zuiguinchor, this region was excluded from the 1998 KAP survey for security reasons. Survey sample selection occurred in late November 1998. Field testing of the survey questionnaires was executed soon after; the actual 1998 survey was conducted from December 20, 1998 through early January 1999.

The 1998 KAP survey objectives included the following:

- Generate accurate estimates of NRM technology adoption levels
- Allow estimates of factors distinguishing adopters and nonadopters of NRM technology
- Generate time series data on "common households"
- Include questionnaires for household heads, leading women, and villages
- Enable comparisons with earlier KAP surveys
- Include households in the target zone of southern Senegal
- Use cluster sampling.

Another important aspect of the IRG team's responsibilities was to collaborate closely with the local contractor, SENAGROSOL-CONSULT, in designing, implementing, and evaluating information from the 1998 KAP survey.

As was documented in the section on the final report of the Natural Resource Management "Limited Scope" Impact Assessment Report, over the years, a series of problems have arisen on the choice of indicators to monitor changes, the interview questions used in the KAP surveys, the coding and storage of

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<sup>29</sup> International Resources Group, SO2, Terms of Reference, page 5.



the data files, and the analysis and reporting of KAP results<sup>30</sup>. A number of survey and related information management issues also arose during implementation of the 1998 KAP survey, including the following:

- Temporary migration of household heads
- Problems in identifying and studying "common households"
- Inconsistency of technology definitions during the period of the four KAP surveys
- Problems in data archiving and data entry procedures from earlier surveys
- Methodology of asking households about NRM adoption
- Variable timing of the KAP surveys
- Length of survey questionnaires.

The relative importance and significance of these issues is discussed more fully in volume 3. Volume 3 also includes an in-depth analysis of changes in the adoption levels of NRM practices in the period 1992–98 using data from the four KAP surveys conducted in the period 1992–98. Information is presented concerning adoption levels of major NRM technologies, including those technologies adopted and used by individual households and those adopted and used by communities.

## 9.2 KAP Survey Results: Changes in Adoption of NRM Practices

Greater importance is given to what is defined as "leading" household NRM technologies, whereas less emphasis is placed on "context" NRM technologies. "Leading" technologies are those for which adoption levels may plausibly have been effected by the programmatic activities of USAID during the period. Included in this group are windbreaks, live fencing, tree planting, alley cropping, composting, erosion control dikes, antisalt dikes, tied ridges, retaining dikes, and improved stoves.<sup>31</sup>

"Context" technologies, in contrast, are those technologies for which changes in levels of adoption are presumed to occur more or less independently of USAID's programmatic activities. Included in this set of technologies are fallowing, use of manure, use of chemical fertilizer, use of agricultural chemicals and pesticides, and crop rotation. Most of these practices have been known and used for decades. Changes in their adoption levels generally have more to do with macroeconomic conditions and trends exogenous to the technology dissemination work with which USAID has been involved in that period than it does with USAID's contributions.

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<sup>30</sup> See section 5, "Information Management System," in the EPIQ report by Kjell Christopherson and others. USAID/Senegal Natural Resources Management "Limited Scope" Impact Assessment Report, May, 1998.

<sup>31</sup> The corresponding French terms used in the 1998 questionnaire are *brise vent*, *haie vive*, *boisement/vergers*, *culture en bande*, *compostage*, *diguettes anti erosives*, *digue antisel*, *billonage cloisonné*, *digue de retenue*, and, *foyer amélioré*.

Using point estimates of adoption levels derived from the KAP surveys for the years 1994, 1996, and 1998, the assessment team looked at NRM technology adoption changes at the household level for the period 1994 to 1998. This analysis revealed the following:

- Evidence from the KAP data strongly suggests that NRM technology adoption has increased throughout the USAID target zone during the period 1992–98. These increases have not been confined to one particular region or one particular type of technology, but rather are evident across many different types of technology and all of the four regions.
- NRM technologies for managing water have shown consistent, although not dramatic, increases in adoption levels. Virtually no households were measured using anti-erosion dikes in 1994, whereas, by 1996, 5 percent and, by 1998, 14 percent of households were using them. This is similar to tied ridges, whose use by households rose by only 4 percent in 1994 to 10 percent in 1998.
- Live fencing, a technology promoted throughout the regions by USAID-supported programs, tripled in use from 6 percent of all rural households in 1994 to 18 percent in 1998. Nine percent of rural households used composting in 1994, and that figure nearly doubled by 1998 to 16 percent. Windbreaks, used by 8 percent of rural households in the target zone in 1994, increased in use to 15 percent in 1994, then fell to 11 percent in 1998.
- In terms of regional differences in NRM adoption during the period 1994–99, three of the four regions in USAID's target zone—Kaolack, Kolda, and Fatick—showed increases in NRM technology adoption levels throughout the period, whereas one—Tambacounda—did not. The relative size of these increases was most notable in Kolda, although it is in Fatick and Kaolack that the consistency of NRM adoption increase was most evident.
- The most rapid and broadly based increases in NRM adoption can be found in the Kolda region and in scattered *arrondissements* in the Kaolack and Fatick regions. The concentrated growth of numbers of technologies adopted by households in the Kolda region might be explained by the migration to that region of farmers from other areas of the country bringing technologies with them—in this case especially Wolof and Serer farmers from the Sine-Saloum.

In addition to this overall regional trend analysis, a number of additional observations can be made about NRM adoption changes. These are as follows:

- *Increased use of improved seed.* Evidence from the KAP surveys suggests that increases in the use of improved seed have been highest in Kaolack, where use rose

from 41 percent in 1994 to 65 percent in 1998, and Tambacounda, where use rose from 25 percent in 1994 to 40 percent in 1998.

- *Tree planting, in many forms, is on the rise.* Evidence from the 1994 to 1998 period is quite conclusive in showing increased tree planting by rural households—one of the major targets of USAID support in the period. A number of different NRM technologies surveyed in the KAP surveys capture these changes, including windbreaks, field tree planting, and plantations and orchards. In each of the four regions surveyed, the proportion of households having planted trees rose from somewhere under 16 percent in 1994 to more than 30 percent in 1998; the actual level of increase was largest in Kolda.
- *Composting is on the rise, but varies from recommended approaches.* Target zone statistics on composting changes show an increase in adoption from 9 percent in 1994 to 16 percent in 1998. In response to the emphasis put on composting by USAID, GOS, and other NGO/donor programs, adoption levels of this technology appear to be increasing.

Prior to 1998, the KAP surveys did not include questions posed directly to the village members about the use of community-based NRM activities. As part of the 1998 KAP survey, a set of questions was directed to leaders in the village, generally with multiple members of the village present to answer the questions. Village members were asked to answer questions about what NRM activities they currently undertake as a community.

The most common community-based NRM activity is the planting of village woodlots. Across the target zone, more than a third of the villages identified this as one of the NRM activities that they undertook. After the planting of village woodlots, the next most common community activities are those related to fire management.

### **9.3 Evolution of Conditions for NRM**

The KAP analysis also looked at the evolution of conditions for NRM during the period 1992 to 1998, including an examination of changes in the delivery of NRM services by service providers. The services examined include (a) extension services for NRM technology transfer, (b) support in the resolution of NRM conflicts, and (c) financing of NRM activities by the rural council or other rural actors. The analysis also explored the changing conditions for NRM through a variety of lenses, including (a) changes in household perception of their well-being as well as their perceived constraints and opportunities, (b) changes in how households use products from the forest or how households perceive changes in access to capital and land during the period, (c) how households perceive some of the changes in laws and codes that have been supported by USAID, as well as (d) changes in the use of animal traction, animal ownership, and farm equipment during the period.

During the period of USAID's investment in the target zone, an increasing number of rural households attended NRM or agricultural extension meetings in each of the major regions; the number of households attending such meetings rose from 47 percent of all households in 1992 to 53 percent in 1998.

About one-fifth of villages in the target zone perceive the rural council as having an important role to play in managing natural resources or resolving conflicts concerning them. Data from the 1998 survey indicate that many more villages look to the village chief or other institutions to assist in managing community resources and resource conflicts. With respect to rural financing, only 11 percent of villages had received any financing from the rural council. In cases in which financing was received by communities, they were more likely to use it for creating or expanding village woodlots (thirty out of seventy villages responding) than any other NRM activity. Although NRM project financing is relatively well dispersed around the target zone, rural council financing is generally bunched in the western part of the zone.

In 1992 each household was asked whether their "income was better or worse compared with three years earlier." Exactly the same question was posed in 1998 about their current income compared with 1995. Overall, the statistics from the two surveys suggest that rural Senegalese incomes are facing a long-term decline in the period 1989 to 1998, although the proportion of households whose incomes are declining is dropping. In 1992, 67 percent of ten rural households stated that their income that year was lower than in 1989. Six years later, in 1998, more than half of the households still stated that their income had dropped since three years earlier, although the number of households saying this had fallen from 67 percent to only 58 percent. Households in Kolda showed the most dramatic improvements in perceived household income. There, although only 21 percent of households said their income had improved between 1989 and 1992, 34 percent said things had gotten better in the period 1995 to 1998.

Households interviewed in the regions of Tambacounda and Kolda did not include environmental problems among their top three constraints. Instead, each of those two regions included the following three constraints as the most serious to them: a lack of infrastructure, problems of health, and lack of means of communication. Although it was not specified in the survey, it appears from discussions with field enumerators that by "infrastructure" and "means of communication," many rural people were referring to roads. In the Fatick and Kaolack areas, in contrast, environmental constraints were noted in the form of "drought," "lack of wood," and "poor soils. Comparison of map data suggests again that problems of land shortage, wood shortage, poor soils, and lack of pasture are relatively less important in the Tambacounda and Kolda regions compared with problems of outmigration, uncontrolled animal movements, and lack of potable water. In the Kaolack and Fatick regions, in contrast, a higher proportion of villages ranked outmigration, wood shortage, and poor soils as a "serious" constraint.

In many areas of the world, increased income levels in rural households have been associated with a decreased reliance on locally available natural resources. With increases in income and agricultural intensification, one can expect rural households to rely on purchased energy sources or livestock feed. In contrast, where income levels are declining, households might be expected to rely more on locally available natural resources rather than those purchased in markets. This trend appears to be occurring in the target zone in Senegal. More households listed more forest products as among the "most important" in 1998

compared with 1992. Those households saying that animal feed and fruits and nuts were among the "most important" products coming from forests rose by 17 percent and 13 percent respectively during the period.

The 1998 KAP survey provides a clear picture of the differential access to capital by rural men and women. The percentages of men and women who had access to credit in cash was approximately the same for the target zone; 5 percent of men and 7 percent of women received credit in cash. But the more common form of receiving credit was far more heavily biased toward men. Across the target zone, 37 percent of men interviewed stated that they had obtained credit either in cash or in kind, whereas the figure for women interviewed was only 17 percent. And this "gender gap" was most stark in the Kaolack region, precisely where the greatest portion of USAID investment has occurred. There, 52 percent of men received credit in cash or kind, whereas only 18 percent of women did. Gender differences affect not only access to capital, but also how rural men and women would like to use that capital if they were to obtain it. In general, men had a greater diversity of priorities for using capital; 32 percent of them said they would use it for livestock, 30 percent for commerce, and 16 percent for agricultural machinery. More than half of women, however, would prefer to invest in commerce if given the chance; only 21 percent said they would invest in livestock.

Households throughout the target zone perceive that land markets are becoming increasingly commodified during the period 1992–98. The proportion of households understanding that they were "free to sell their lands" rose from one out of ten rural households in 1992 to one out of four in 1998. In the eastern areas of Tambacounda and Kolda, this increased perception of land transferability was even more marked, rising from 8 percent of households in Tambacounda in 1992 to more than a third of households in 1998 and from 5 percent of households in Kolda in 1992 to 20 percent in 1998.

Those households at risk of losing their lands employed two major strategies for protecting themselves: they built fences around the land, and they planted trees on them. Each of these protective strategies were employed by roughly a third of those at risk of losing land, although the tree-planting strategy was much more common in the eastern portion of the zone (Tambacounda and Kolda). The practice of putting tree or fence boundaries around parcels as a means of securing them (*bandage*) appears to be common where families are trying to hold onto land for family members who have emigrated from the village but are expected to return. Such evidence of land securitization makes it clear that NRM technology adoption (in this case, tree planting) is part of a multi-objective strategy of rural households, in which those objectives include not only improved resource management but also practical means of protecting land assets from risk of loss through trade. Indeed, it may be that the very practice of marking land with trees or fences, as measured here, would serve as an effective indicator of land insecurity or land conflict.

As part of the 1998 KAP survey, household heads and women leaders were asked about their levels of awareness of select NRM-related laws and codes. Most notable about the results concerning awareness of NRM-related laws and codes is the high level of awareness—at least for men—of the New Forest Code. That four out of ten rural households should already be aware of the "principal elements" of a law that was only promulgated in 1995 suggests both the law's importance and the success of USAID and GOS efforts to educate the rural populace about it.

In general, the proportion of rural households in the target zone owning farm equipment and farm animals did not change dramatically between 1992 and 1998. A number of trends do emerge, however, most notably, the continued increase in ownership of donkeys throughout the zone and increases in mechanization in the Kolda region. In the past two decades, farmers in the Peanut basin have gradually replaced the slower ox with the faster horse and donkey, particularly for upland cultivation. Although the KAP survey did not generate statistics for the proportion of farmers using animal traction, it is generally accepted that traction is used for nearly 100 percent of upland planting. Household studies for the region have shown that one key determinant of farm productivity is the ownership of animals for traction, which allows the owners to get a jump start on cultivation of their fields; those who borrow animals must wait until the owners are finished.

## **9.4 Analysis of Reasons for Adoption and Nonadoption of NRM Practices**

Identifying reasons for adoption or nonadoption of NRM technologies is a focus of the analysis throughout the entire SO2 impact assessment report. In the KAP analysis, the adoption/nonadoption issue was addressed by applying statistical analyses to the available 1998 KAP data. The analysis included both a bivariate analysis and a multivariate analysis.

Of the variables included in the bivariate analysis, ecoregion appears to have the most pronounced association with adoption or nonadoption. Only 18 percent of those in the Eastern Transition Region use NRM, whereas 75 percent do in the Casamance (excluding Zuiguinchor) and 54 percent do in the Shield Region.

One of the more striking results of the analysis was that those households that had received an extension visit in the previous cropping season were much more likely to be adopters of NRM technology than those that had not. "Extension" as used here, is not limited to government extension agents, but includes anyone promoting the use of improved technologies for farming. Of the 23 percent in the sample population that had someone—translating directly from the questionnaire—"visit their field the previous season to discuss the agricultural problems that you have," 68 percent were users of NRM technologies. Among the 77 percent of the sample that had not received such a visit, far fewer (55 percent) used NRM technology. Such statistics support the assertion that agricultural and NRM extension, when properly conducted (i.e., through actual visits to farmer's fields), can be associated with notably higher levels of NRM adoption.

Households with more adult laborers were more likely to be users of NRM technologies, in part because of the labor intensity of many of the NRM technologies. Although households with fewer than nine working-age adults were about as likely to be NRM adopters as the average, 67 percent of those with nine or more working-age adults were NRM adopters.

Another characteristic distinguishing NRM adopters from nonadopters is the receipt of remittances. Those households that claimed to have received more than 25,000 FCFA in the twelve months prior to the survey were more likely to be adopters of NRM; the percent of NRM adoption in this case was 64 percent. Of

those households that had not received more than 25,000 FCFA in the previous year, only 56 percent were NRM adopters.

A number of variables are notable for not having a significant association with NRM adoption. The team had hypothesized that those households with large farms, ownership and use of animal traction, and knowledge of the New Forest Code might be more likely to adopt NRM. In fact, although larger farms do appear slightly more likely to be NRM users, the difference between them and small farms (2 hectares or less) is minor. Similarly with animal traction, for which virtually no difference exists in NRM adoption between those that own animals for traction (58 percent adopters) and those that do not (57 percent of adopters). It was assumed that knowledge of the New Forest Code might encourage NRM adoption by providing greater security to those interested in using tree-based technologies to stabilize or improve productivity. As with the animal traction variable, however, virtually no difference existed with respect to adoption for those who knew the Forest Code and those who did not.

The multivariate analysis revealed that, other things being equal, ecoregional variables have a greater impact on the likelihood of adopting NRM than any of the other variables included in the analysis. Even after controlling for land, labor, and capital differences, the analysis suggests that households are far more likely to adopt NRM when living in the Casamance ecoregion than when living in the Eastern Transition ecoregion. Ecoregions are in effect characterized by a combination of land quality, rainfall, and general ecological conditions. The implications of these results are important, in that they suggest that a household's allocation of economic assets may be less important in determining whether it uses improved natural resource management practices than the endowment handed to the household simply by virtue of where it is located.

Among the four variables over which a household may have greater control (assuming it is not prepared to move to another ecoregion), the adult labor and remittance variables go furthest in explaining increases in adoption of NRM. Households that receive more than FCFA 25,000 per year in remittances, other things being equal, are considerably more likely to adopt NRM than those households without such available funds. These results reflect the reality that investing in NRM requires a significant amount of capital.

A number of policy implications for USAID and GOS are raised by these results:

- The importance of capital access and capital markets should not be ignored if USAID hopes to improve natural resource management.
- The analysis confirms that labor shortages are one of the primary constraints to increasing NRM adoption and that resolution of this constraint contributes directly and significantly to increasing NRM adoption. Future technology proposals should, therefore, pay special attention to this labor shortage.
- In spite of the apparent decline in land quality in the Saloum, the overall probability of NRM adoption increasing in that ecoregion and the consequent potential for NRM

impacts is higher there than in any other ecoregion in the target zone except the Casamance. And this result is true even after accounting for land quantity, labor availability, and capital access differences.

- No conclusive evidence exists that directing NRM programs to large rather than small farmers or to traction animal owners rather than nontraction animal owners, will have any significant impact on changing NRM adoption.

## **9.5 Conclusions and Recommendations**

USAID's KAP surveys during the period 1992–98 provide a unique source of data about changes in households' perceptions and use of NRM technologies. Indeed, few if any similar data sets exist in the Sahel that allow for both time series and cross-sectional analysis over such a large geographic area and diverse a population. The KAP survey designers in 1991 created the tool with the objective—among others—to generate information that would allow analysts to estimate the factors that would contribute to increasing the likelihood of technology adoption among the target population. Now, seven years after the first survey, such an analysis has become possible and has been completed and included here. The KAP information is a rich mine of information about NRM changes in Senegal and merits further analysis beyond what was possible in this report. In this final section of the report, we draw a number of conclusions and recommendations from the analysis of KAP data.

### **9.5.1. Changes in Adoption Levels of NRM Technologies**

Between 1992 and 1998, USAID's SO2 program attempted to create the conditions for broadly based increases in improved NRM technology adoption in the Kaolack, Fatick, Casamance, Kolda, and Tambacounda regions of Senegal. One of the objectives of the KAP analysis under this SO2 impact assessment report is to analyze KAP surveys from the years 1992, 1994, 1996, and 1998 to assess whether NRM adoption had increased or decreased during the period. Notwithstanding a number of methodological constraints in measuring NRM change with the KAP survey, a series of conclusions can be drawn about changes in NRM adoption levels during the period.

Throughout the target region analyzed in this SO2 impact assessment, adoption levels of many key NRM technologies clearly increased during the period 1992 to 1998. Leading these increases were windbreaks, planting of field trees, improved stoves, live fencing, composting, and a variety of water management technologies. Anecdotal evidence from field visits by the SO2 impact assessment team confirms these upward trends in technology adoption.

By 1998 one of the key indicators of NRM technology awareness and interest—planting of trees in fields—was being done by nearly half (43 percent) of rural households. Although many of these trees were mango or citrus rather than those species more commonly recommended by NRM experts, this level of active resource management investment is quite high. Use of two other technologies commonly recommended under NRM programs supported by USAID—live fencing and windbreaks—also grew



during the study period, but did not reach the same levels of proliferation as tree planting. In 1998 only 18 percent of farmers were using live fencing, whereas 11 percent were planting windbreaks. Water management technologies appeared to increase in use during the target period, but were still at rather low levels of adoption throughout the zone by 1998. Further study would be required to compare the number of water management technology adopters to the number of households with land for which water management technologies would be appropriate in the first place.

Although some upward bias exists in time series comparisons of NRM technology adoption between 1994 and 1998, cross-regional comparisons of adoption levels generated from 1998 KAP data do not suffer the same biases. The region with the largest levels of NRM technology adoption increases was Kolda, where two technologies increased in use by more than 40 percent during the period (assisted regeneration and field tree planting) and five increased by more than 20 percent (the previous two plus water retention dikes, anti-erosion dikes, and plantations and orchards). Although some technologies saw large increases in Kolda, others declined. Included in the list of technologies for which use declined in the period were alley cropping, nursery techniques, windbreaks, and improved seed.

NRM technology adoption increases were the most consistent and widespread in the Fatick and Kolda regions, where virtually all of the "leading" technologies measured saw increases during the period of study. The size of these increases, however, was relatively smaller than in Kolda. The Tambacounda region, which is mostly located in the Agricultural Expansion or Eastern Transition Ecoregions, saw much lower levels of technology adoption increases than the other areas of the country.

### **9.5.2. Evolution of the Conditions for NRM Technology Adoption**

The KAP analysis looked at a host of variables in addition to technology adoption, most of which were selected to shed light on the conditions for technology adoption and more generally the conditions for rural household production. A number of conclusions emerge from the analysis:

*Increased effectiveness in delivery of NRM-related extension messages.* KAP evidence suggests that NRM and agricultural extension services reached more people in 1998 than in 1992 and that the impact of this increased number of visits was both real and measurable. Included in these "extension services" was not only GOS extension agents, but also all NGOs and project personnel, including those supported directly and indirectly by USAID's program assistance. In 1992, 47 percent of households in the target zone received NRM/agricultural extension visits. This figure had risen to 53 percent by 1998. Further analysis included in this study suggests that receiving a visit from an extension agent was a critical determining factor in whether or not households adopted NRM. Among those households that did receive a visit to their fields by an extension agent, 68 percent adopted one of the improved NRM technologies. In contrast, of those that did not receive a visit, only 57 percent adopted NRM. In sum, more households received extension visits, and those that did receive them were more likely to adopt NRM.

*Continued investments in labor-saving farm animals.* A long-term trend toward continued investment in labor-saving farm machinery is apparent in the period 1992–98. Households throughout the target zone

increased their investments in donkeys, whereas Kolda and Tambacounda saw increased ownership levels of oxen.

*Gender differences in access to capital and awareness of laws and codes.* To the extent that access to capital is an important determinant of NRM adoption, women would appear to be at a special disadvantage, because the KAP survey shows that women are less likely to receive credit than men. Programs such as KAED are taking important steps to resolve this constraint. Similarly, women are less likely to be aware of key laws and codes concerning natural resource management than their male household counterparts. This gender bias in capital and information access emerges as an important constraint to expanded NRM adoption by women.

*Extent and concentration of NRM financing by the rural council.* The Mission's upcoming decentralization SO focuses on facilitating the means by which rural councils can provide financing for NRM activities. Evidence from the 1998 KAP shows that the baseline values for this rural council support are presently quite low. Across the target region, only 11 percent of villages surveyed had received any financing for NRM from the rural council. The region with the highest proportion of villages receiving such financing was Fatick (18 percent), whereas the comparable figure in Kolda was only 5 percent. Such figures suggest an important space for upward expansion of the role of the councils. It also raises the issue of alternative sources of financing for NRM activities and the need to analyze the costs and benefits of facilitating additional financing flows through these mechanisms.

*Continuing shortage of labor for rural production.* One of the persistent myths of household production in Senegal is that a surplus of available rural labor exists. Although formal sector employment statistics may support this myth, evidence from informal production in the rural sector and from the KAP analysis here do not. Statistical analysis of NRM adopters shows that one of the key constraints to household adoption is whether the household has access to sufficient labor. This constraint appears to be more important than the amount of land a household has available to it and possibly more important than its ability to access capital. Present and future NRM and environmental programs in Senegal should pay special heed to this constraint. A number of successful activities have combined, for example, labor-saving, income-generating activities with NRM practices that do not require heavy amounts of labor during the cropping season.

*Continued investment by households in animal traction.* In each of the regions of the target zone, the proportion of households purchasing donkeys and oxen increased during the period 1992–98. These two animals, used primarily for animal traction, represent a significant cost to the rural household, yet can reap important labor-saving rewards. For example, in many other Sahelian countries, increased access to donkey carts has made it feasible for rural populations to invest more efforts in the construction of stone lines and other erosion control structures and to transport poles, fuelwood, garden crops, and other farm products to more distant markets more economically. Future private sector demand assessments should pay special attention to this household investment trend, in particular by paying special heed to what this pattern suggests about the importance of the labor constraint and by what it offers in terms of opportunity for the increased adoption of NRM and related income-generating practices.

### 9.5.3. Factors Affecting the Likelihood of NRM Technology Adoption

Although many studies have measured adoption levels of NRM technologies in the Sahel, few have used these data to distinguish between those households that adopt NRM and those that do not. How does the average household that uses improved NRM technologies differ from those that do not? NRM program development—not to mention program development in other rural sectors—could benefit from development of a market profile of NRM users. This report has used 1998 KAP data in an effort to create this market profile and, more generally, to determine what it is that makes NRM adopters different from the rest of the rural population.

*Overall NRM adopter profile.* The rural Senegalese household that uses NRM will, on average, be distinguished by a number of characteristics. Compared with the average rural household, it will be (a) more likely to be in regular touch with extension workers (of NGOs, government, or other institutions), (b) more likely to have many (more than nine) adult laborers, (c) more likely to have received regular off-farm remittances and, (d) more likely to be from either the Casamance or the Saloum ecoregions.

*Fundamental importance of ecoregional endowment.* The ecoregional endowment facing a rural household contributes more to the likelihood of their adoption of NRM than any other tested variable. All other things being equal, 77 percent of households in the Casamance ecoregion (excluding Zuiguinchor) can be expected to use NRM, whereas only 19 percent can be expected to use it in the Eastern Transition Ecoregion. Given these facts, program planners working in the Eastern Transition Ecoregion would be wise to ask whether the value per dollar spent in trying to increase NRM adoption there is worth it given other opportunities elsewhere. The CBNRM project has paid attention to the importance of ecoregions, including it as an important factor in their KAPs and monitoring and evaluation work. In addition, it is worth noting that these ecoregions as defined do not necessarily overlap closely with rainfall, which has often been referred to as a critical determinant of NRM use. Rainfall in the Saloum is not much different from the Agricultural Expansion Ecoregion, but the likelihood of NRM adoption is considerably different (64 percent compared with 47 percent). Other factors, such as land use pressures, demographic pressures, and access to investment capital, labor, and markets, seem to exert a greater influence than rainfall.

*Importance of access to capital via remittances.* Both the bivariate and multivariate analyses highlighted the important link between access of households to remittances of more than FCFA 25,000 and adoption of NRM technologies. Although remittance declarations are not highly reliable as point estimates, we believe the categories used for the analysis are broad enough to reflect a general difference among households with access and nonaccess to this capital. What is unclear, of course, is the causal link between a household having more accessible capital and its investment in NRM technologies. Is a household more likely to invest in NRM because it has access to capital and because NRM investments require more capital? Or, is the household with access to remittances also the same household with the connections to the world beyond the village that allow it to be more aware of NRM technologies than other households? Or, are the NRM investments paying off and contributing to increased access to capital?

*Labor and NRM technology adoption.* A household with eight or fewer adult laborers is less likely than the average household to use NRM technologies. But, as the number of adult laborers rises above eight,

the likelihood of them using NRM rises rapidly. Sixty-seven percent of the households with nine or more adult workers use NRM, whereas between 55 and 57 percent of those households with eight or fewer laborers use it. This characteristic of NRM technology adopters might also be used in the process of targeting current and future NRM programs.

Apart from any specific conclusions about which variables increase the likelihood of adoption, the statistical analysis conducted here raises the important question of precisely how target populations are defined during program or project design and elaboration. What are the exact target populations of the private sector and decentralization programs? And what is the hypothesized causal linkage between what those programs do and the measurable impact they have on changing the behavior of those target populations? The analysis included here suggests that thinking carefully about the characteristics of subsets of the overall rural population can be an important means of enhancing program success. We would recommend that future USAID programs take the time to look into these characteristics and carefully define the "consumer profiles" of the target populations they hope to change or affect.

#### **9.5.4. Design and Implementation of the KAP Surveys and Linkages to Environmental Monitoring**

A number of lessons emerged from this study about the way in which KAP surveys and environmental monitoring tools can and should be used by USAID. Key conclusions and recommendations are summarized here:

*Correlation between program size and long-term impact monitoring with KAP surveys.* Each of the KAP surveys of 1992, 1994, 1996, and 1998 cost between US\$50,000 and US\$80,000 to implement and analyze. In four years, a rough estimate of the cost of implementing the four KAP surveys would, therefore, be around US\$300,000. To this should be added some portion of the environmental monitoring program of the CSE and USGS, which was to contribute information necessary to track the impact of USAID's NRM portfolio. Even including the cost of the CSE/USGS program, USAID's total commitment to impact monitoring is still lower than 5 percent of the SO<sub>2</sub> program, the standard level included in World Bank guidelines. In sum, the resources dedicated to the KAP surveys have not been sufficient to design and implement surveys with the precision and quality required to track SO<sub>2</sub> on a sustained basis. The specific funding constraint applies not so much to the implementation of surveys on the ground, but rather to their design. In each of the KAP surveys, the following areas have not been given sufficient attention or resources: sample design, integration of sampling approach with other surveys, questionnaire design, spatial aspects of the survey, intended survey outputs, computer summary systems, data storage strategy, and data analysis and reporting.

*Linkages between KAP survey information and the long-term environmental monitoring program have been lacking.* Prior to the 1998 KAP survey, the KAP process was little integrated with the environmental monitoring work under the CSE/USGS project. The outcome from the lack of integration is evident. It has been difficult for the CSE/USGS experts to gain access to KAP data from earlier years. KAP surveys have not included spatial coding on questionnaires, and sampling approaches were designed without regard to spatial issues. Issues covered in the KAP surveys do not directly link with the data layers

in CSE/USGS maps. In spite of incompatibilities, however, the potential for linking the existing KAP data series on households with spatial information is real and should be pursued further. Concentrations of high-probability NRM adopters might be mapped, as could a variety of other NRM characteristics. USGS work on GIS software training should be extended to the designers and implementers of future socioeconomic surveys. Experts from USGS and McGill University might be engaged to deepen the analytical work they undertook to begin linking KAP survey data with spatial information.

*Linkages between household KAP monitoring conducted by different SO2 projects.* USAID has encouraged its programs to invest in proper and consistent monitoring of NRM impacts and conditions. Many good examples of this work exist, the most notable being the monitoring work of the CBNRM project and the KAED project. But in spite of these good individual efforts, the SO2 has suffered from a lack of overall coordination in these project-level impact-monitoring efforts. One of the issues of greatest interest to the Mission was the ability to compare the impacts of the SO2 program in areas in which one of its projects was active to another comparable area in which the SO2 was not active. But two major obstacles have made this type of comparison difficult. First, no systematic effort was made to identify the precise areas in which each of the SO2 projects was active in villages. Without these maps or, at least, lists of villages where SO2-funded programs were active, it is difficult to create a "with" and "without" set of villages or households to survey. Second, project surveys generally focused only on villages in which those projects were active without surveying another set of villages in which the project had no activities at all. USAID, in its role as coordinator of the program, might have dedicated more resources to the coordination of these project-based monitoring efforts. In the future, greater effort should be devoted to integrating a range of survey and monitoring tools to gather the full range of socioeconomic and biophysical information needed to monitor the evolving context for NRM program investment as well as the impacts of these programs and the ways and means to optimize those impacts and improve program management.

#### **9.5.5. Assessing the Impact of USAID's SO2 in the Period 1992–98**

USAID was among the major financial supporters of NRM technology development and diffusion in the target zone in the period 1992 to 1998. During this period, available KAP evidence suggests that adoption of NRM technologies increased. Direct and scientifically proven attribution of these increases to USAID's assistance is not possible in light of the measurement issues addressed above. At the same time, two major reasons exist for thinking that USAID's assistance played a role in the technology expansion during the period. First, available evidence on NRM adoption highlights the importance of extension to the adoption process. Those who had received extension visits were considerably more likely to adopt NRM technologies than those who had not. USAID's program supported both field visits (through such projects as KAED, SRP, and Rodale) and the development of technologies that would be appropriate for extension dissemination (such as natural resource–based agricultural research and Rodale). In short, USAID places special emphasis on getting out and meeting with rural households to develop, adapt, and disseminate NRM messages and technologies; those households were much more likely to adopt NRM than other households. A second reason for thinking that USAID's SO2 contributed to an increase in NRM use during the period is the substantial scope of the SO2 program and size of USAID investment compared with other programs and donors. One might argue that, without the involvement of USAID during the period, the level of

knowledge about NRM in public and private research and extension networks may not have increased as rapidly as it did.

#### **9.5.6. Implications of the KAP Analysis for Current and Future USAID Programs**

Taken together with the contextual information and other data reported in the overall SO2 assessment report (including the "Limited Scope" Impact Assessment Report [May 1998]) and Volumes 1 and 2 of this full impact assessment report), the information and analysis included in this KAP analysis is very useful to USAID's upcoming decentralization and private sector programs, because it provides an understanding of the dynamics of rural production and a snapshot of the rural sector in 1998. The information that is especially pertinent to the decentralization program consists of rural council financing of NRM activities, knowledge levels of the rural population concerning key laws and codes, perceptions about which rural institutions are responsible for conflict resolution, and the extent and types of community-based NRM activities. The private sector program will most likely have even more to gain from this analysis than the decentralization program. In its efforts to broaden market accessibility in the rural sector, the private sector program could benefit from information about the following issues: market penetration of select technologies, gender-disaggregated data on access to capital markets, and ownership levels of key household productive assets (especially farm equipment, farm animals, available land, and available labor).

One area of particular importance is the use of forest products from common lands. The evidence is strong that the *economic or social importance of common area forests to rural households is greater now than it was only seven years ago*. This increased importance suggests that organization of communities around initiatives to protect tree cover and manage the remaining areas of national forest may be more likely to meet with success now, a conclusion with implications for the new SO2 on decentralization. The evidence here also makes it clear that enhancing certain private sector market opportunities—such as for fruit and nut sales, honey collection and sale, and animal feed and fattening—may have immediate repercussions for common area resource conservation. Future SO1 activities, therefore, will need to pay special attention to ensure that the products targeted for increased sales and distribution are gathered and produced in a way that is consistent with common area resource conservation.

This analysis also contributes to USAID's new programs by providing input into the methodological issues concerning how new programs can learn from the monitoring efforts of the past, particularly through the use of large-scale household surveys. Because both of the new programs are being launched at approximately the same time, it may be wise to include a core baseline survey instrument on the rural sector that could serve as a point of departure. Design of such an instrument would have much to gain from the lessons learned from the 1992–98 KAP surveys and would be able to borrow significantly from select elements of those surveys. The leading lesson to take into account in any effort to create a new baseline survey is to spend more time and money on the following issues:

- On sample design and sample selection, *ensure statistical and methodological consistency with environmental monitoring surveys, other KAP and project surveys, and demographic and health surveys.*

- *Make use of past lessons learned and data in design of future surveys.* Those involved in past USAID-funded surveys should be consulted in the design of future surveys, even if they are not to play any role in survey execution.
- *Develop local capacity and support local participation in the survey process. Make provisions for involving stakeholders in the survey design and in the discussion and analysis of survey results.*
- *On questionnaire design and testing, develop detailed translations of the questionnaire, at least for key words, into local languages. Catalogue and field test specific definitions of concepts. Ensure that all questions included in the questionnaire will be utilized in the final analysis.*
- *Develop small software procedures for data management, analysis, and report production.*
- *Ensure that the surveys respond to the program management needs of the implementing agencies and program beneficiaries and are not simply driven by the needs of reporting to USAID/Washington.* This will promote greater local ownership and increased attention to the usefulness and quality of the results.
- *Ensure that the survey data are well managed and accessible to interested parties and that the survey results are disseminated in an appropriate manner.*

## 10.0 Lessons Learned

### 10.1 Specific Lessons Learned

The following are some specific lessons learned in the course of this impact assessment:

- The results of narrowly focused programs tend to be necessary but not sufficient to increase agricultural production and rural incomes in the absence of basic rural services (input supply, marketing, transportation, credit, and extension services), which are among the enabling conditions for a productive and profitable agricultural sector.
- The adoption of NRM practices and investment in maintaining the natural resource base will primarily be accepted by rural populations when linked to helping sustain an income stream (rationale) and can be at least partially supported by that income stream (means). NRM practices should be introduced in the context of income-generating activities, whereby the NRM practices will contribute to sustaining and improving the income generated (KAED, CBNRM, SZWM, Winrock, and the Rodale Institute).
- Unless democracy and governance activities are focused on improving some concrete aspect in the life of local populations, they run the risk of not attracting the dedication and commitment of stakeholders, without which the governance innovations may not survive the end of the program.
- NRM programs, in general, and CBNRM, in particular, need to develop a system that prioritizes interventions in a manner so that obtaining some "quick victories" becomes part of the implementation plan.
- Rural groups, GIEs, and co-ops in Senegal are reliable and viable business partners who do not consider a loan a gift and who work hard to maintain their creditworthiness (KAED).
- % Training members to understand principles of accounting and financial management goes a long way toward helping ensure accountability and transparency.
- Local groups and co-ops can establish enterprises that profitably provide basic rural services among other profit-oriented activities, provided that they have access to capital and training in functional literacy and financial management (KAED and other NGOs).
- Women's groups have demonstrated the capacity to manage small enterprises and both bank credit and internal revolving credit funds. Individual women have demonstrated competency as representatives of civil society and as officers of businesses.
- This demonstrated economic clout and personal capacity is beginning to change perceptions and attitudes about women at the local level.
- NRM activities, particularly those related to tree planting, have resulted in women gaining access to land both as common (group) and individual fields and receiving certificates of use rights from the CR.



- % Access to land has helped women generate income or capital to finance other activities, particularly revolving credit.

## 10.2 Considerations for SO1 and SO2 Programming

The impact assessment team believes that potential exists for significant synergy among activities in the new SO1 (private sector) and SO2 (democracy and governance). This belief is based particularly on the analysis of the KAED and CBNRM programs and on the potential interaction of programs adopting the better aspects of these two programs.

Achieving both improved management of the physical territory that makes up a subzone and economic growth within that subzone is likely to require a more intensive interaction and investment than is foreseen in the CBNRM subprojects. The subproject plans outline the need for some fairly ambitious investments in the protection of the natural physical environment including erosion control, development and conservation of small valleys, development and conservation of ponds, pasture improvement, improved livestock production, and improved soil fertility. These activities are mapped and planned at the subzone level, but to the extent possible will be executed by individuals. CBNRM is attempting to implement them through federations/promoters in which each GIE, professional association, and village association in the subzone are members. These federations will have primary responsibility for the execution of these subprojects under the supervision of the NRMC and CERP. It will be interesting to see if CBNRM succeeds in establishing a system that plans globally but acts individually and whether the aggregation of group and individual activities achieves the subzone-wide plan.

The economic growth activities are thinly spread. For example, in a subzone that has eleven villages and a few hundred families, the plans only call for a single 1-hectare garden, ten head of cattle for fattening, one input supply store, and a small nursery. Although some or even all of these might be group activities, so that entire associations benefit from an increased source of income, typically more associations exist than income-generating activities planned for the subzone. Furthermore, little investment and support for the associations themselves will occur. To date, CRs rarely have more than one functional literacy program per zone, so many subzones will not even have a local functional literacy program that associations and village groups can access. Some management training will be provided to the federations/promoters beginning in 1999, but this probably will not impact more than a single member per GIE or local association. Although this is a beginning, it is not likely to be sufficient to turn these GIEs or local associations into viable business entities that can successfully undertake income-generating activities on their own. It also is not evident that CBNRM can or will invest in association-specific activities or help arrange access to credit so they can finance their own activities. In addition, a plan does not appear to exist on how different associations could undertake different activities so the subzone ends up with a range of services and income-generating opportunities and each association has a clientele sufficiently large to allow its activity to become profitable. The opportunity exists to add this type of economic development planning to the LUMPs, which now focus predominantly on the physical environment and land use, so that they result in a more complete regional plan.

But CBNRM (or a CBNRM- oriented SO2 program) has neither the personnel nor the funding necessary to provide training and mentoring at the level of local GIEs and associations nor a program to provide those groups with access to credit. This is where it would be useful to have the support of an SO1-type program that was oriented toward working directly with these groups, providing training in functional literacy, numeracy, and financial management, facilitating access to credit, and having access to additional resources to implement the program. Given that a number of the GIEs and associations in a small cluster of villages are likely to be overlapping, some economies of scale should be achieved by doing some joint training for groups in close geographic proximity. It should also be useful for several groups in close proximity to target their primary enterprises so that they provide a range of services for the combined population of members. With limited resources and where villages and hamlets are in close proximity, providing access to a grain mill, an input supply store and a grain and peanut marketing enterprise would be more beneficial to the communities than three grain mills. An SO1-type program may be the best placed to support and mentor the development of such enterprises; however, PRA work and interaction with the types of representative structures developed by a CBNRM/SO2-type program would be helpful in planning these enterprises and organizing them in local clusters. Many opportunities would exist for the two types of programs to interact and help serve the needs of the other, providing synergy.

A CBNRM/SO2-type activity might initiate discussion of separate enterprises serving a small cluster of villages and identify some potential targets of opportunity during a PRA type activity. Entered in the modified LUMPs/regional plans, this would provide an element addressing economic development and some broad guidelines to help orient an SO1-type activity. The establishment of such enterprises would provide some economic development content to the regional plans. If well planned, KAED experience demonstrates that village and professional associations can provide the basis for functional and dynamic GIEs and local co-ops that operate profitable enterprises, some of which provide basic services to local producers and residents. In addition, the successful KAED GIEs have used the capital generated in part to provide revolving credit funds that members can access. These small individual loans, such as those to the GIEs, have high repayment rates and demonstrate direct benefits to significant numbers of families and individuals. This is a route to people-level benefits, which an SO2 program focusing on management of natural resources at the communal/CR level has difficulty accessing.

SO1-type activities would provide a base of trained people and better performing GIEs/local associations to contribute to the representative structure developed by an SO2-type activity. As GIEs/local associations develop transparency and accountability and use democratic procedures, they will contribute directly to several SO2 objectives, including a change in the norms by which local institutions operate and improved governance at the local level. As in KAED, an SO1 program would likely facilitate access to credit through use of a credit guarantee fund, as well as by providing support to financial institutions for the preparation and processing of the applications, which in turn results in support to help GIEs prepare credit applications. By supporting a number of geographical clusters and/or GIEs/local associations within a subzone, the SO1 program would build a program that impacts a critical mass of rural producers and residents in each subzone where it operates.

A new SO1 program should provide GIEs or village groups with more input into the choice of the enterprise and the types of investments that will be made. They should also take a larger role in managing

procurement of commodities and contracting services than was allowed in KAED to gain experience in these areas, which are important to the continuity and sustainability of the enterprises. It should also test the option of using both paid field staff and local-level facilitators. KAED demonstrated the effectiveness of paid field staff and Winrock has demonstrated the importance of training local facilitators who remain in a target area after the program comes to an end. The combination of the two provides the promise that paid staff serve as the motors of program activity, while local facilitators help provide better understanding of the population and improved sustainability of program-initiated activities.

### **10.3 Opportunities for NRM programming in Senegal<sup>32</sup>**

NRM programming in Senegal could be improved in a number of areas to address the degradation of the natural resource base. Rainfall has continued to decline for several decades and there is little that anyone can do about that. Many other areas of activity must be undertaken in a manner that takes this declining rainfall into account.

As stated in the specific lessons learned stated above, many aspects of NRM are most likely to be successful if they are undertaken hand in hand with activities oriented toward economic growth. Many NRM practices have the best chance of being adopted when they support and enhance income-producing activities, which in turn provide a portion of the means to invest in those practices. This implies that some of the basic needs for improved NRM are the same as those needed for a dynamic and productive agricultural sector and economic growth in the sector. Among those needs are the availability of basic rural services such as input supply, credit, marketing, transport, and access to information about improved technologies. Experience in other countries indicates that access to adequate agricultural research and extension are prerequisites to increasing agricultural development. This does not mean to imply that the Senegalese Government should return to providing all of these services. Yet experience elsewhere demonstrates that adoption of new technologies, agricultural development, and increased rural incomes are not likely to be part of the future, unless a relatively adequate level of such services is available to rural producers from some source. If macroeconomic conditions do not favor the commercial private sector providing such services, then perhaps programming needs to explore the possibility of providing such services at the local level through GIEs, independent local co-ops, and so on. Unless the conditions for economic growth, and particularly rural development are established, it seems that it will be difficult to facilitate widespread adoption of important NRM practices. NRM activities are a necessary complement to the basics of agricultural development; they are not necessarily a substitute for those basics<sup>33</sup>. In the past, however, the basics often did not include much concern for long-term sustainability, nor for insuring that proposed activities were technically, economically, and socially acceptable to rural producers and residents.

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<sup>32</sup> This presentation knowingly neglects the Senegal River Valley, which for the most part is located outside USAID/Senegal's zone of reliable rainfall.

<sup>33</sup> Note that, recently, both John Mellor (1998) and Carl Eicher (1999) have written articles on the need to return to basics to achieve development objectives in Africa and reinforce different elements of the thesis presented here.

The NRM activities need to be integrated with economic growth activities to help insure that the economic growth activities are implemented in a manner that is sustainable in the long run and responds to the needs, desires and resource constraints of the rural population.

One of those basics is a reasonably functional and adequate agricultural research and extension system. Both agricultural research and agricultural extension seem not to be very functional in Senegal. The Senegalese government eliminated or greatly reduced the scope of most of the regional development organizations, that once provided extension services (as well as input delivery, credit, and some marketing) to most rural producers. The World Bank began a National Agricultural Extension Project (Projet National de Vulgarisation Agricole), but did not expand the project beyond the pilot phase. ISRA has managed to resist both USAID and World Bank efforts to make it a reasonably effective agricultural research organization. With these basic services lacking or in disarray, it is difficult to imagine Senegal making rapid progress toward increased agricultural production and productivity and increased rural incomes, or on the NRM activities that would help support them.

The lack of dynamic agricultural research and extension programs have more direct consequences for NRM activities. With regard to research, the lack of a compost technology acceptable to farmers has already been mentioned. Composting is one of the most important types of NRM technology that addresses soil fertility and agricultural productivity at the same time. Although numerous attempts have been made to introduce composting in cemented pits, this seems to have been soundly rejected by farmers, yet NRBAR and ISRA did not complete the adaptive research cycle to find an acceptable alternative. Farmers are happy to adopt the cemented pits when someone else is paying for it, but rarely do farmers decide to pay for it themselves. In the absence of a composting technology that has proved technically, economically, and socially acceptable to farmers, no composting technology exists that is appropriate for extension to rural producers. That is a sad state of affairs given the potential that composting holds for improving both the soil resource and its productivity.

Wind erosion is undoubtedly one of the greatest causes of land and soil degradation and declining agricultural productivity. Declining rainfall trends exacerbate this problem. Increased vegetative cover, particularly in the form of field trees and even more specifically in the form of nitrogen-fixing leguminous trees such as *Acacia albida*, is one of the most promising technologies for limiting this degradation. The acacia parkland area in the Thies Region demonstrates the capacity to limit degradation and improve crop yields. *Acacia albida* is difficult to grow from seed and survival rates of seedlings are poor. The chance of success is much better when the acacia regenerates naturally, and feeding the pods and seeds to livestock greatly improves the chances of germination. Although a number of NGO and small projects are promoting this proven practice, no broadly based extension system exists to promote and support this technology on a wide scale. *Acacia albida* does not grow throughout Senegal, so no single solution exists to the problem. With changes in rainfall and climate, the extent of its range needs to be tested. Where it does not and will not grow, natural regeneration of indigenous legumes and multipurpose species should be promoted to reduce wind erosion and soil degradation. Diffusion of such programs might be done in the context of either

an agricultural or agroforestry program, but no broadly based extension programs exist to serve this function.<sup>34</sup>

Windbreaks also have the potential to be a major help in the fight against soil degradation caused by wind erosion. However, in the extensive production systems used in most of Senegal, particularly those areas facing wind erosion, it is difficult to convince farmers that windbreaks increase productivity enough to offset the loss of cultivated area necessary to grow the windbreaks. Perhaps the new trend toward demarcating field boundaries with trees provides an opportunity to persuade farmers that some intensification and systematization of those plantings, particularly where perpendicular to the prevailing winds, can provide some important additional benefits for fighting soil degradation.

Senegal badly needs to intensify agricultural production on those areas where conditions are naturally or can be made conducive to intensive agriculture. EROS/CSE projections indicate that if present trends continue, every scrap of tillable soil in Senegal will be cultivated by the year 2050, including all the land set aside in protected areas. No easy solution, however, exists for intensification, particularly in the absence of adequate rainfall. Where farmers are uncertain that their crops will survive long enough to attain maturity, it is nearly impossible to persuade them to invest in productivity-enhancing technologies. If one could break the cycle of frequent crop failures in those areas with somewhat reliable rainfall with drought-resistant varieties and/or soil moisture-enhancing techniques, perhaps progress could be made. Those farmers who do have the requisite rainfall need access to a series of technologies, each of which increases productivity and profitability as it is added to the system. But such breakthroughs and adapted techniques are unlikely in the absence of an effective agricultural research and extension program.

A portion of the decline in the use of fallow, and the increase in area cultivated may reflect uncertainty about land tenure. Many farmers seem to be cultivating all of the land they possess in fear that it might be given to someone else, if it is not cultivated. They are also uncertain whether the traditional land tenure rules or the newer National Domain law (1964) will determine the conditions under which they can maintain the rights to their land. This is one of the probable causes for the increase in field boundary demarcation: tree planting helps establish land tenure rights under both traditional rules and the land improvement sections of the National Domain law. Agricultural intensification may be hindered in part because farmers feel that they must cultivate every square meter of land to maintain their claim on the land.

There are also a number of programming improvements that could be made in the forestry and agroforestry area. One of the most obvious, already referred to above would be a much greater emphasis on natural regeneration in agroforestry activities, where feasible, rather than planting trees. The Jim Jam program costs less to encourage natural regeneration across an entire CR consisting of thirty-one village territories, than it costs to produce a single hectare of tree plantation. And based on SRP experience, the planted trees

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<sup>34</sup> Agricultural programs in the peanut basin made the huge mistake of persuading farmers to eliminate almost all of the trees and shrubs in their fields with the idea of making it easier to implement mechanized crop production activities. This has contributed significantly to soil degradation, left few trees to regenerate naturally, and created an attitude that must be overcome to increase the presence of field trees substantially.

often have rather mediocre survival rates, in addition to substantial costs. Where regeneration occurs naturally, the primary cost of increasing tree populations is the time necessary to mark trees for preservation and their potential competition with cultivated crops. Few species are as cooperative as the *Acacia albida*, which loses its leaves during the rainy season in addition to fixing nitrogen in the soil. The Jim Jam experience and the "seeds for trees" program of Winrock and the Peace Corps demonstrate the potential and minimal cost of natural regeneration approaches. The replicability, however, of the Jim Jam experience has not been tested, and the "seeds for trees" program is just beginning to test the replicability of the pilot experience in an additional five CRs. Both experiences (and others) need to be tested, studied, and lessons extracted, to determine how to mount broadly based programs promoting natural regeneration.

Another promising approach to helping limit deforestation and declining vegetative cover to protect fragile soils is the use of improved wood-burning cook stoves. Improved cook stoves, both clay and metal, have demonstrated the capacity to reduce the amount of fuelwood used by 30 to 50 percent, providing either a significant cost reduction for users or reducing the time required for fuelwood collection. The cost of the clay wood stoves is primarily the effort to get the clay and a couple of hours of work for construction. In addition the improved cook stoves reduce cooking time and the danger of burns, particularly for young children; in addition, the clay models are particularly easy to construct and repair. NGOs and other programs have demonstrated that it is relatively easy to train village women to make their own clay wood stoves, and that there is a market for the metal wood stove made by artisans as well. The improved cook stoves are ready for diffusion, but lack program support for widespread dissemination. Given the hundreds of thousands of families that use wood for cooking, even a conservative savings of 100 kilograms of fuelwood per year per stove would save the deforestation of thousands of hectares each year. Because reforestation programs rarely if ever produce even a few thousand hectares a year, the improved cook stoves have greater potential for helping balance fuelwood supply and demand, than do the much more costly reforestation programs.

Although natural regeneration holds the promise of being able to increase the number of trees in field and pastureland settings significantly, it too is not a solution for all situations. It is not a very effective system for establishing boundary demarcation, windbreaks, or live fencing and would be a rather slow way to develop a woodlot where one does not presently exist. Although other promising approaches have been neglected, there will be a continuing need for agroforestry and reforestation programs involving nurseries and outplanting of seedlings. The availability of seedlings, particularly of indigenous species continues to be one of the important constraints to increased tree planting. A number of programs have had mixed successes establishing private nurseries, often because they find themselves trying to sell seedlings when government-run nurseries are giving them away. The government-run nurseries typically cannot meet the demand when a program promotes tree planting, but they do poison the environment for private nurseries. Many rural residents would rather wait to see whether they can get free seedlings next year than pay for seedlings this year, even if the species they prefer is not available and they have the means to pay for the seedlings. Yet, although this has been obvious for years, the government seems to find it politically unacceptable to stop producing seedlings. Perhaps a compromise would be for government nurseries to provide seedlings only for public works activities, that is, trees not intended for individual, family, or private sector ownership and use. This would perhaps help private nurseries to develop the (private sector) markets they need to be financially viable from year to year.

There tends to be a relatively strong demand for fruit tree seedlings in most areas with adequate rainfall. Yet, the improved grafted varieties tend to be available primarily around the major urban centers. Private nursery operators would benefit significantly from training in grafting techniques and access to the plant stock for producing grafted seedlings. In addition the availability of seeds for many indigenous species seems to be limited. It would be interesting to develop a program, either public or private, to supply such seeds, as well as seed pots and other basic materials to private sector nurseries.

Senegal needs to develop a natural forest management program that collaborates with local populations to manage public woodlands, pasturelands, and coastal areas, including protected areas. Most governments have come to understand that they do not have the resources to protect an area unless the local population living near the resources actively participates in their conservation. This typically requires allowing local populations to also participate in planning activities for that resource and obtaining some benefits from its use. Although the entire Sahel used to look to Senegal for leadership in technology and new concepts, Senegal has become a regional laggard in many of these areas, including participatory natural forest management. Such programs provide a means of helping fight fraud and abuse of power, as well as neglect. It is hard to imagine that 2,000 immigrant families would have received "permission" to clear land in the Pata Forest, if local communities had been involved in the management and decisionmaking process. Where long-established conflicts exist between local interests and government purpose, participatory resource management may not be an easy process. But, in most cases with such long-established conflicts, the resource has already been destroyed or seriously degraded to the point that little is left to manage. Undertaking a difficult process is better than just watching helplessly as the resources disappear.

Kolda, and particularly Tambacounda, are among the few regions of Senegal that still have significant forest areas that are not seriously degraded by human activity. These are the areas that would benefit most from natural forest management and from intensification of agricultural production. Although their river valleys have the potential to support intensive agriculture, the majority of their land area is marginal with considerable relief, prone to water and soil erosion, and presently protected by extensive forests. Deforestation, however, will be followed rapidly by serious soil degradation. Although the total population in these regions is relatively small, the population per hectare of arable land is beginning to rival those in the much more heavily populated peanut basin. It seems likely that future population growth will quickly lead to deforestation of marginal and erosion-prone soils, leading to rapid soil degradation. Senegal needs to undertake some of the types of programs discussed here to prevent Kolda and Tambacounda from experiencing a degradation of their natural resource bases that is as bad or worse than that inflicted on the peanut basin.

Other areas of Senegal with relief and slope could also benefit from an intensification of water and soil erosion control. Although some fairly substantial soil and water control efforts have been undertaken in areas such as Kayemor, these techniques are still not used in many areas that face serious degradation from waterborne soil erosion. A number of essential techniques are known, including use of rock dikes where rocks are available and use of grass strips, vetiver or tree barriers, live fences, or earth dikes where rocks are not available or the slopes are either shorter or less steep. Again, the techniques seem to be available for diffusion, but limited dissemination of and support for the use of these techniques occurs. In areas where

rocks are available, they are often found at some distance from where they are needed and transportation is a significant constraint. The availability of plant material is often constrains establishment of green barriers.

One of the few really impressive reforestation programs in Senegal is the dune stabilization program through the Nayas region and along the Great Coast. The program originally began during the Colonial Period, and many donors, including USAID have contributed to the endeavor. Populations in the Nayas region have found their villages and oasis-like depressions are threatened by blow sand to the point of obliteration. They needed little persuading and few incentives to undertake reforestation efforts to stabilize the sand dunes and protect their homes and livelihood. Other donors seem to be providing the support required at this time. Where a local population has such devotion to activities that serve a private as well as a public purpose, however, support should not be denied.

One other situation in which similar devotion may exist regards land affected by salt intrusion along the rivers and tributaries that constitute Senegal's water courses. The CBNRM activities at Pakane provide an example:

Pakane seems to be one of the few areas with a happy convergence of priorities between the population and the CBNRM program, which has led to real devotion and progress toward the program's objectives. Pakane has a large area on the banks of the Baobolon that produces rice during the rainy season and is converted to vegetable gardens during the dry season. The productivity of this area is essential to the prosperity of the local population and is threatened by salt intrusion from the Baobolon. The population's objective was to establish a green barrier between the salt-laden water and the rice fields and gardens. This was complicated by the fact that salt has killed almost everything that once grew in the soil along the watercourse. Fortunately, eucalyptus proved fairly resistant to the effects of the salt. The population planted strips of eucalyptus trees, perhaps 100 meters wide for hundreds of meters between the fields and the water, particularly on the side from which the prevailing winds blow. The population and others in Senegal seem to have the mistaken belief that the eucalyptus can actually desalinize the wasteland that has been created by salt intrusion. No scientific basis exists for this belief, but the green barrier may well help stop salt crystals from being borne by the wind into productive fields.

Thousands of hectares of productive land are similarly threatened along Senegal's many watercourses. Whether the eucalyptus or other species can survive (more than a short time) and whether the green barrier does protect the fields from salt intrusion needs to be determined. If so, the technique should be developed and disseminated to help other rural producers facing a similar threat. As for the sand dune stabilization, this may be one of those rare instances in which the benefits are so obvious and important to the local populations that only limited support will be necessary to achieve substantial adoption and impact.

Properly designed and located antisalt dikes certainly have the potential for preventing salt from the ocean from moving upstream in some of the water courses, particularly the smaller tributaries. Experience with antisalt dikes, however, seems to be fairly mixed; they are also expensive. The dikes have proven difficult to manage, in part because the interests of producers above and below the dike are contradictory. Those above want to hold as much freshwater as possible and those below want to release as much as possible. Declining flows of freshwater in the watercourses due to reduced rainfall have often resulted in insufficient



freshwater to meet everyone's needs and particularly to flush the salt from the areas above the dike that would supposedly be protected and put in production. In other cases, wetland soils that dried out due to the dike were so acidic that nothing could grow. Although may be the solution in some cases, they should be researched carefully.

On another note, little question exists that Dakar and other major urban areas are facing serious pollution problems: poor sewage systems, limited collection and disposal of solid wastes, polluted surface water, poor control of industrial effluent, leaking of underground fuel tanks, and so on. Although pollution issues have traditionally been outside the range of USAID/Senegal's NRM/environmental programs, no doubt exists that Senegal has significant and increasing programming needs in the pollution area.

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